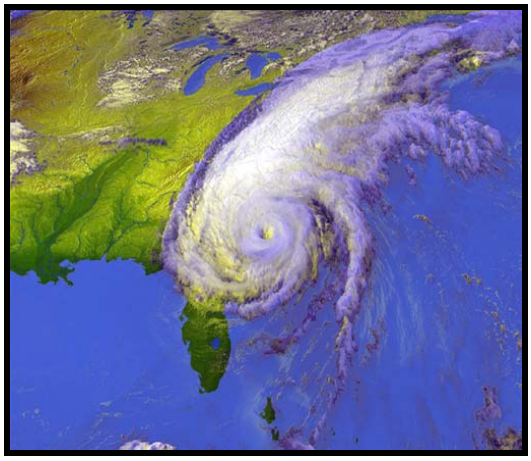
HAZARD MITIGATION PLAN

City of Greenville, North Carolina



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Department of Planning & Community Development

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INTRODUCTION

A. PURPOSE & AUTHORITY

As a condition to receiving Hazard Mitigation Grant Awards, the City of Greenville is required to prepare a Local Hazard Mitigation Plan (LHMP), which shall serve the following purposes:

- To document and describe the public process and plan preparation
- To identify the different types of hazards and specify new actions that the City will take to reduce its vulnerability to natural hazards, and minimize the impact of hazardous events in the future
- To identify activities and methods the City currently implements and continues to support, either in their current form or a modified form, and speed recovery and redevelopment following future disaster events
- To qualify for additional grant funding in the pre-disaster and post-disaster environment
- To demonstrate a firm local commitment to hazard mitigation principles
- To comply with both State and Federal legislative requirements for local hazard mitigation plans.

This plan intends to meet this goal through reviewing the following areas: hazard identification and analysis, probability of hazard events, Greenville's vulnerability to hazards, mitigation capability, acceptability assessment, identification of goals and objectives, policies, implementation, monitoring, and evaluation and update of the plan once it has been approved and adopted. The Greenville City Council approved the original draft of the plan on Thursday, May 10, 2001. The revised draft of the plan was adopted by City Council on **November 8, 2004**. The resolution of adoption is located in the appendix of this plan. This plan has been developed to be in accordance with current rules and regulations governing local hazard mitigation plans. The plan shall be routinely monitored to maintain compliance with Senate Bill 300, and the Disaster Mitigation Act of 2000.

B. PLANNING PROCESS & PUBLIC INVOLVEMENT

Initial planning phases for the development of the City of Greenville Hazard Mitigation Plan began not long after Hurricane Floyd swept through Eastern North Carolina in September of 1999. City Council held a series of public meetings to discuss disaster relief, relocation of homes and people, moratoriums on development, and mitigation efforts. In addition, council created a new division within the Department of Planning and Community Development known as the Flood Recovery Center. The Flood Recovery Center consisted of Planners, a sales coordinator, a relocation specialist, and a housing counselor.

City Planners were responsible for the following:

- Administration of the Hazard Mitigation Grant Program (HMGP)
- Administration of the Repair and Replacement Grant Program

- Administration of State Acquisition Relocation Funds (SARF)
- Assistance with the relocation of homeowners and tenants affected by the HMGP
- Coordinated efforts to write the first draft of the Hazard Mitigation Plan
- Coordinated applications for flood survivors to receive free elevation certificates
- Coordinated applications for flood survivors to receive free, voluntary demolitions
- Identified and inspected comparable housing units to insure housing was decent, safe and sanitary

The Sales Coordinator had the following responsibilities:

- Assisted with the marketing and sales of City-sponsored subdivisions
- Utilized infrastructure grant funds which subsidized the cost of infrastructure that lowered sales prices of housing

The Relocation Specialist had the following responsibilities:

- Assisted homeowners and tenants of properties purchased by the City using HMGP funding to find other places to live in across the City limits, and even into the county
- Worked with the Sales Coordinator with relocation to City-sponsored subdivision projects

The Housing Counselor had the following responsibilities:

- Assisted flood survivors in identifying assistance based on individual needs
- Administered Small Business Administration (SBA) loans to those flood survivors that qualified

The Hazard Mitigation Grant Program was continuously advertised in the local newspaper, The Daily Reflector, for early public review on floodplain management. Specifically, the December 12, 1999 issue outlined an effort to solicit public involvement. Carl Rees, Flood Recovery Center Director, Gloria Kesler, Housing Counselor, and Chantae Matthews, Planner were the primary staff involved in the Flood Recovery Center along with a few others. Many positions within this division were created as temporary full-time positions. In addition, a consultant named Pat Young of Holland Consulting Planners, Inc. composed the original draft of the plan.

The Affordable Housing Loan Committee (AHLC) was very involved in the Flood Recovery Process as a standing city committee. The AHLC was authorized to determine just compensation for flooded properties. The AHLC was a well-versed group in housing and redevelopment issues, which were so critical in the aftermath of Hurricane Floyd. After Hurricane Floyd, flood recovery issues, hazard mitigation and disaster recovery were discussed in length throughout these meetings in public forums about how the City of Greenville would recover from this devastating storm, and find ways to minimize impacts and potential damage of future natural hazards. A little less than a month after Hurricane Floyd, the Affordable Housing Loan Committee held a public meeting on October 26, 1999 to discuss the Hazard Mitigation Grant Program (HMGP) and the application process for providing citizens with flood recovery assistance. Advertisements, notices and memos were sent out all over the City after this meeting. At this specific time, the number and locations of damaged properties had not been specifically identified. Merrill Flood, Deputy Director of Planning and Community Development and Pat Young of Holland Consulting Planners presented a map to the Affordable Housing Loan Committee on December 9, 1999 identifying the total properties that

were flooded, and those that were eligible to receive State hazard mitigation funding. By the next meeting on December 20, 1999, Phase I of III of the Hazard Mitigation Grant Program was submitted to the State in order to receive assistance funding. As a part of the Hazard Mitigation Grant Program, the State informed City staff that a Local Hazard Mitigation Plan would be due in order to continue providing Greenville with funding.

An Unmet Needs Committee (private group) was also formed and had meetings to discuss hazard mitigation. Representatives from the following agencies/organizations attended Unmet Needs Committee meetings:

- City of Greenville Planning Department
- Pitt County Planning Department
- Pitt County Department of Social Services
- Pitt County Department of Emergency Management
- Greenville Interfaith Disaster Recovery Team (GIFT)
- Pitt County United Way
- Salvation Army
- Hope After Floyd (mental health outreach – sponsored by state funds)
- Housing counselors representing all areas of Pitt County
- Legal Services of North Carolina
- State Emergency Response Team (SERT)

On February 10, 2000 the Greenville City Council appointed thirteen (13) citizens to serve on a Flood Recovery Task Force, which primarily consisted of members of the Affordable Housing Loan Committee, but also contained members of the Greenville Interfaith Disaster Recovery Team (GIFT), the Salvation Army, the United Way, and a local church (Sycamore Hill Missionary Baptist Church). Many of the members of the Flood Recovery Task Force also attended the Unmet Needs committee meetings. The Flood Recovery Task Force met a total of four times to discuss the formation of the first draft of this plan as well as discuss other disaster recovery issues. There was an opportunity for comments by the public at these meetings, which were held during the draft stages. A draft of the plan was given to the task force members to review on April 11, 2001. The plan was presented to members of the City's Planning and Zoning Commission on April 17, 2001 for their review and comments. The plan was also presented to the Flood Recovery Task Force a second time on April 25, 2001. A few of the members made specific suggestions on the content of the plan and stated that the final approvals would be forwarded no later than May 1, 2001. Table 1 gives a listing of the members of the Flood Recovery Task Force.

Table 1:
Flood Recovery Task Force Members

Member Name	Title/Group Represented	Address
Martha Matthews	Vice President - Greenville Interfaith Disaster Recovery Team (GIFT)	P.O. Box 3945; Greenville, NC 27836
Major Fred Carver	Salvation Army	2337 Dickinson Ave; Greenville, NC 27834
Dr. Howard Parker	Pastor of Sycamore Hill Missionary Baptist Church	1001 Hooker Road; Greenville, NC 27834

Lynn Pharr	Executive Director - United Way of Greenville	P.O. Box 1028; Greenville, NC 27834
Dr. Nancy Mayberry	GIFT Board Member, East Carolina Professor of Foreign Languages	1903 East 9th Street; Greenville, NC 27858
Walter Council	Affordable Housing Loan Committee	410 M. L. King, Jr. Blvd.; Greenville, NC 27834
Evan Lewis, attorney	Affordable Housing Loan Committee	P.O. Box 7283; Greenville, NC 27835
Gloria Pearsall, Vice Chair	Affordable Housing Loan Committee	1533 Greenville Blvd.; Greenville, NC 27834
Dr. Umesh Gulati, Chairman	Affordable Housing Loan Committee	309 Queen Anne Road; Greenville, NC 27858
Paula Graham	Affordable Housing Loan Committee	1103 Johnson St.; Greenville, NC 27858
Wilma Dupree	Affordable Housing Loan Committee	411 Greenfield Blvd.; Greenville, NC 27834
Toya Sanders	Affordable Housing Loan Committee	132 Oakmont Dr, Apt H; Greenville, NC 27834
Iyeisa Simmons	Affordable Housing Loan Committee	204-58 Rollins Drive; Greenville, NC 27834

Upon making the final changes, the first draft of the plan was presented and approved by City Council on May 10, 2001.

The City of Greenville's initial plan was approved in accordance with Senate Bill 300 and determined to be in full compliance as of May 7, 2002 contingent upon new FEMA requirements of the Federal Disaster Mitigation Act of 2000. A new committee of staff members was formed to update the changes associated with new requirements featuring the following members and their titles:

- Jason Pauling – Group Facilitator, Planner II – Long Range Planning
- Merrill Flood – Director of Planning & Community Development
- Carl Rees – Neighborhood Services Coordinator, Flood Recovery Supervisor*
- Gloria Kesler – Planner – Community Development, Housing Relocation Specialist*
- Chris Davis – Senior Planner – Community Development
- Neil Holthouser – Senior Planner – Long Range Planning
- Karen Gilkey – Planner – Community Development
- Chantae (Matthews) Gooby – Planner II – Current Planning, Planner – Flood Recovery*
- Christian Lockamy – GIS Specialist – Current Planning

**** Position with the Flood Recovery Center***

This Hazard Mitigation Planning Team met a total of four (4) times to discuss the updates and changes to this plan based on the initial crosswalk review. An opportunity was provided for neighboring communities, agencies, businesses, academia, nonprofits, and other interested parties to be involved. The draft plan was mailed to the following for their review and comments:

1) Pitt County (Planning & Health Depts.)
2) The Town of Ayden
3) The City of Winterville
4) The City of Farmville
5) The Town of Bethel
6) The Town of Fountain
7) Greenville Utilities Comm. (business)
8) East Carolina University (acadamia)
9) Pitt County Memorial Hospital
10) DSM Pharmaceuticals (business)
11) Pitt County Council on Aging (non-profit)
12) American Red Cross (non-profit)
13) Salvation Army (non-profit)
14) Habitat for Humanity (non-profit)
15) United Way (non-profit)

In addition, an ad was placed in the Daily Reflector (Greenville's Newspaper) advertising that the City of Greenville would hold a public hearing for the Planning and Zoning Commission to solicit public comments on the plan. Additionally, this plan was taken before the City's Environmental Advisory Commission for their review while in the draft phase. The Environmental Advisory Commission met on October 7, 2004 to discuss this plan and make recommendations. The Greenville Planning & Zoning Commission met on October 19, 2004 to discuss the plan, and hold a public hearing to reserve public comments. The final review for adoption came through City Council who met on November 8, 2004 to adopt the plan. A copy of the resolution of adoption is included with the plan.

END OF SECTION

BACKGROUND & CAPABILITY ASSESSMENT

A. GREENVILLE: COMMUNITY PROFILE

The City of Greenville is located in the Coastal Plain region of North Carolina in the eastern part of the state. The Tar/Pamlico River runs through Greenville, and serves as its main natural feature. Other natural features include Green Mill Run, Bells Branch, Hardee Creek, Meeting House Branch, Schoolhouse Branch, Harris Mill Run, Parkers Creek, Swift Creek and Fork Swamp. Swift Creek and Fork Swamp are located in the southern most portion of Greenville and actually empty into the Nuese River, and are part of the Neuse River Basin. The entire jurisdiction lies at or below an elevation of 25-feet above sea level, which is the City's major challenge relating to natural disasters, particularly severe flooding. It is about 85 miles east of Raleigh, 41 miles southeast of Rocky Mount, 117 miles north of Wilmington, and about 170 miles west of Cape Hatteras. *(Source: North Carolina 2002 State Transportation Map).* Greenville serves as the County Seat for Pitt County. Pitt County has a total land area of 656.5 square miles. The City of Greenville is composed of 28.5 square miles within its city limits, and roughly 34 square miles within its ETJ. The 2000 Census yielded a total population in Greenville of 60,476 people. In 2003, Greenville had 65,799 residents, which was about a 3.7 percent increase from the previous year. Table 2 portrays Greenville's population and includes estimates through 2009. An expanded version of this table is also provided in the future vulnerability section to display population growth through the year 2029 based on a flat-line projection.

Table 2:
Greenville Population Analysis (Part I)

Year	Population	% change per year	Average annual% change per decade	Year	Population	% change per year	Average annual% change per decade	Year	Population	% change per year	Average annual% change per decade
1980	35,740	X	3.435	**1990**	46,305	-4.21	1.944	**2000**	61,209	5.215	2.866
1981	36,591	2.381		**1991**	47,400	2.365		**2001**	60,966	-0.4	
1982	36,860	0.735		**1992**	48,238	1.768		**2002**	63,444	4.065	
1983	37,791	2.526		**1993**	51,149	6.035		**2003**	65,799	3.712	
1984	39,995	5.832		**1994**	52,070	1.801		**2004**	67,685	2.866	
1985	40,297	0.755		**1995**	56,307	8.137		**2005**	69,810	2.866	
1986	41,912	4.008		**1996**	58,900	4.605		**2006**	71,811	2.866	
1987	43,130	2.906		**1997**	55,877	-5.13		**2007**	73,869	2.866	
1988	44,748	3.751		**1998**	56,853	1.747		**2008**	75,986	2.866	
1989	48,339	8.025		**1999**	58,175	2.325		**2009**	78,164	2.866	

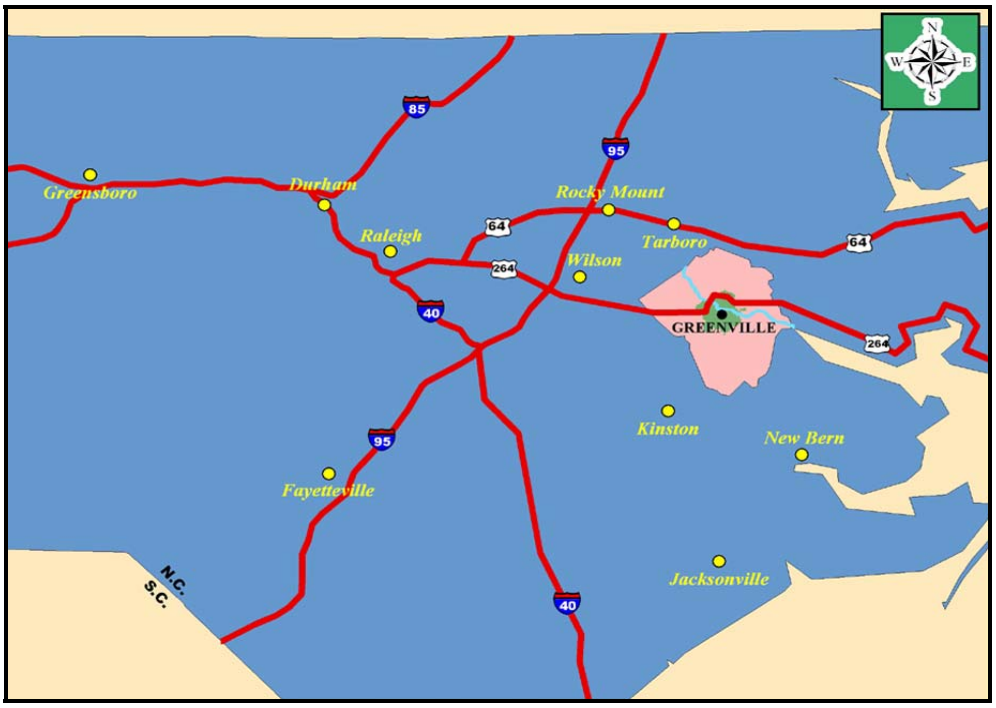
East Carolina University (ECU) had an enrollment of 20,624 students in the fall of 2002. Greenville comprises nearly 45 percent of the population for the entire county. Between 1990 and 2000, Greenville's population increased by just over 30 percent, whereas the County's population grew about 21 percent, and North Carolina's total state population grew at about 22 percent. Much of the population growth is in the increase of the number of students that attend ECU and maintain households within the City, the increased number of retired aged individuals, and the amount of annexation, which consumed both land and people. Greenville has not experienced in-migration to explain the growth. The average persons-per-household in Greenville is 2.18, and there are about 52.4 percent of non-family households. The City of Greenville contains 28,145 total dwelling units; 54 percent multi-family units, 34.6 percent single-family detached units, 6.6 percent single-family attached units, and 4.8 percent mobile homes. The amount of owner occupied units is 39.3 percent. *(Source: U.S. Census Bureau Website (www.census.gov)).* Much of Greenville's rural character is beginning to become urbanized with the increasing expansion to the south, and the continued expansion of utility services to accommodate for severe sprawl. Surrounding communities include Winterville, Ayden, Farmville, Bethel and Simpson, all of which have also experienced a change in growth largely from people that have moved away from Greenville's urban core as blight has begun to occur in some areas of the inner city. Table 3 gives a breakdown of Greenville's land use composition inside the city limits, and within Greenville's ETJ.

Table 3:
City of Greenville Existing Land Use (2002)

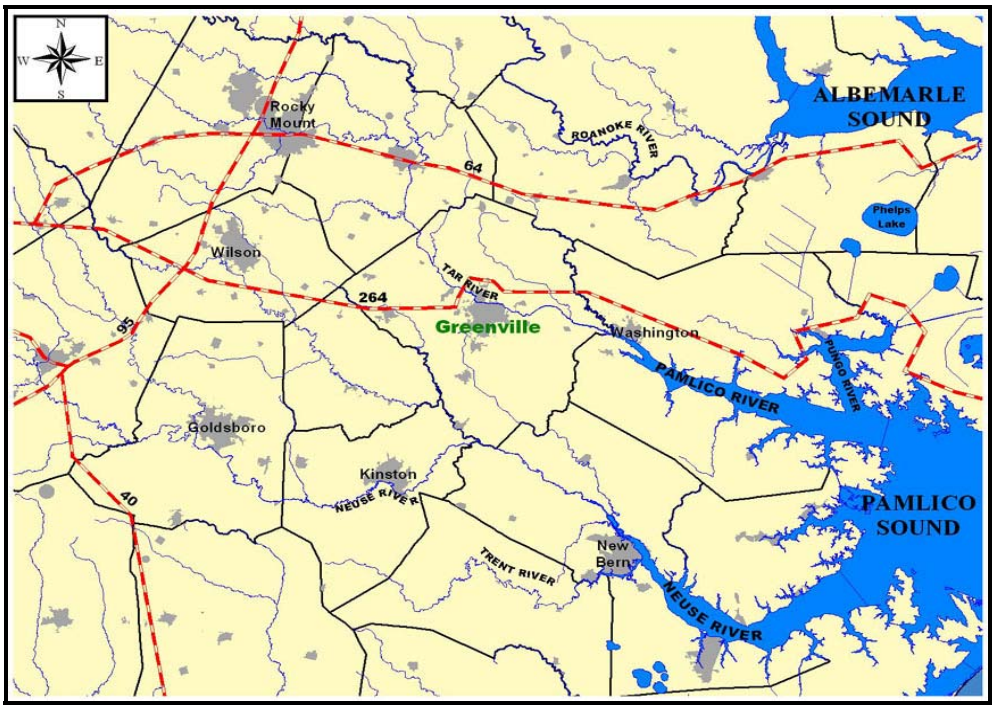
Land Use Category	City Limits		ETJ	
Existing Land Use	City Limits (Acres)	% of Total City Limit Acreage	ETJ (Acres)	% of Total ETJ Acreage
Commercial	1350.56	8.53%	433.84	2.00%
Industrial	920.49	5.81%	1174.49	5.40%
Institutional	1417.46	8.95%	250.72	1.15%
Residential (Multi-family)	2144.48	13.54%	20.24	0.09%
Office	467.90	2.95%	98.62	0.45%
Recreation & Parks	1345.13	8.49%	322.49	1.48%
Residential (Single-family)	3545.69	22.38%	2469.37	11.36%
Utility	363.29	2.29%	139.55	0.64%
Vacant	4285.83	27.06%	16828.66	77.42%
Total	**15840.84**	100.00%	**21737.98**	100.00%

Maps 1 and 2 on the next page illustrate the location of Greenville and its surroundings in the eastern part of the state, and the natural resources map of the city. Greenville is not a coastal city, so therefore is not subject to as many natural limitations, but because it is so flat and has a significant amount of wetlands, Greenville has key natural features that should be addressed using this plan, and identified as areas for quality planning and hazard mitigation.

Map 1:
Location Map: This map indicates the primary location of Greenville's jurisdiction within the boundaries of Pitt County



Map 2:
Natural Areas Map: This map illustrates the rivers and natural features associated with Greenville



B. CITY STAFF, BOARDS & ORGANIZATIONAL CAPABILITIES

The City of Greenville operates under the City Council-City Manager form of government. Six (6) City Council members are elected based on five (5) voting districts, and one (1) at-large member. The City has over 500 total employees within the following departments:

Administration	*Financial Services*	*Fire-Rescue*
Human Resources	*Information Technology*	*Planning & Comm. Development*
Public Works	*Recreation & Parks*	*Police & Neighborhood Services*

Greenville also has several boards and commissions that serve in an advisory capacity to the City Council. All boards and commissions consist of volunteers who are appointed by the City Council to serve specific terms. The following is a listing of City boards and commissions:

Affordable Housing Loan Committee	*Board of Adjustment*
Citizens Advisory Comm. On Cable TV	*Community Appearance Commission*
Environmental Advisory Commission	*Fireman's Relief Fund Committee*
Greenville Utilities Commission	*Historic Preservation Commission*
Housing Authority	*Human Relations Council*
Pitt-Greenville Airport Authority	*Pitt-Greenville Conv. & Visitors Authority*
Planning & Zoning Commission	*Police Community Relations Committee*
Public Transit & Parking Commission	*Redevelopment Commission*

C. GREENVILLE'S ECONOMIC & INSTITUTIONAL CAPABILITIES

Greenville Utilities Commission provides the primary water, sewer, gas and electric services for the City of Greenville as well as a few other municipalities of Pitt County. Greenville is considered a primary industrial, educational and medical economic engine within Eastern North Carolina. Some of the Greenville's major employers include East Carolina University, Pitt County Memorial Hospital, Pitt Community College, DSM Pharmaceuticals, NACCO Materials Handling Group, Grady-White Boats, Overton's Sports Center, Inc., and Trade Oil Company.

East Carolina University (ECU) is the primary institution of higher learning within Greenville's city limits. ECU contains over 20,000 students annually, and offers about 100 undergraduate degree programs, nearly 90 graduate degree programs, and 13 doctorate degree programs. ECU is most known for its School of Medicine. It is a member of the 16-campus University of North Carolina System. The other institution is Pitt Community College located partly in Greenville, which awards associate degrees, diplomas and certificates for 56 programs. Enrollment averages about 5,000 students per semester. The Pitt County Schools System consists of 33 schools, including two high schools within Greenville's city limits (J.H. Rose High School, and South Central High School). The system serves about 20,600 students and employs about 1,500 teachers.

Greenville also contains several commerce, tourism and industrial development entities based within the city limits, including the Convention and Visitors Bureau, the West Greenville Community

Development Corporation, the Pitt-Greenville Chamber of Commerce, Uptown Greenville, Inc., and the Greenville Convention Center.

(Source: 2004-Living in Pitt County Book of Facts, "The Daily Reflector", Sunday May 22, 2004).

D. LEGAL & FISCAL CAPABILITIES

As a general rule, local governments have only that legal authority which is granted to them by their home state. This principle, that all power is vested in the State and can only be exercised to the extent it is delegated, is known as "Dillon's Rule," and applies to all North Carolina's political subdivisions. Enabling legislation in North Carolina grants a wide array of powers to its cities, towns, and counties.

Local regulations, which are enacted within the bounds of the state's enabling authority, do not automatically meet with judicial acceptance. Any restrictions that local governments impose on land use or building practices must follow the procedural requirements of the Fourteenth Amendment, or risk invalidation.

These and other constitutional mandates apply to federal and state governments, and all their political subdivisions such as the City of Greenville . Any mitigation measures that are undertaken by Greenville in its regulatory capacity must be worded and enforced carefully within the parameters established by the state and federal Constitutions, even when such measures are authorized by the General Statutes of North Carolina, and even when such measures are enacted in order to protect public health and safety by protecting the community from the impacts of natural hazards.

Within the limits of Dillon's Rule and the federal and state Constitutions, Greenville has a wide latitude within which to institute mitigation programs, policies, and actions. Greenville's powers fall into one of four basic groups (although some governmental activities may be classified as more than one type of power): regulations & policies, acquisition of property, taxation, and spending. Hazard mitigation measures can be carried out under each of the four types of powers. Following are a list of these powers and how they may be useful tools for hazard mitigation:

❖ *REGULATIONS*

♦ General Police Power

Greenville has been granted broad regulatory powers based on the North Carolina General Statutes, allowing the City to enact and enforce ordinances, which define, prohibit, regulate, or abate acts, omissions, or conditions detrimental to the health, safety, and welfare of the people, and to define and abate nuisances (including public health nuisances). Since hazard mitigation can be included under the police power (as protection of public health, safety, and welfare), towns, cities, and counties may include requirements for hazard mitigation in local ordinances. Greenville uses its ordinance-making power to abate "nuisances," which could include, by local definition, any activity or condition making people or property more vulnerable to any hazard.

- **Building Codes and Building Inspections**

Many structural mitigation measures involve constructing and retrofitting homes, businesses, and other structures according to standards designed to make the buildings more resilient to the impacts of natural hazards. Many of these standards are imposed through The City of Greenville's Building Code. North Carolina has a state compulsory building code, which applies throughout the state (N.C.G.S. 143-138). However, Greenville has adopted codes for the respective areas if approved by the state as providing "adequate minimum standards." However, these regulations cannot be less restrictive than the state code.

The City of Greenville is also empowered to carry out building inspections. N.C.G.S. Ch. 160A, Art. 19, Part 5; and Ch. 153A, Art. 18, Part 4 "empower cities and counties to create an inspection department, and enumerates its duties and responsibilities, which include enforcing state and local laws relating to the construction."

- **Land Use, Zoning & Floodplain Regulation**

Through various land use regulatory powers, the City of Greenville controls the amount, timing, density, quality, and location of new development; all these characteristics of growth can determine the level of vulnerability to Greenville in the event of a natural hazard. Land use regulatory powers include the power to engage in planning, enact and enforce zoning ordinances, floodplain ordinances, and subdivision controls.

Zoning is the most traditional and ubiquitous tool that Greenville uses to control the use of land. Broad enabling authority for Greenville to engage in zoning is granted in N.C.G.S. 160A-381. The statutory purpose for the grant of power is to promote health, safety, morals, or the general welfare of the community. Land "uses" controlled by zoning include the type of use (e.g., residential, commercial, industrial) as well as minimum specifications for use such as lot size, building height and set backs, density of population, and the like. Greenville is authorized to divide its territorial jurisdiction into zoning districts, and to regulate and restrict the erection, construction, reconstruction, alteration, repair or use of buildings, structures, or land within those districts. Districts may include general use districts, overlay districts, and special use districts or conditional use districts. The City of Greenville's Zoning Ordinance is located in Title IX of the City Code, and consists of maps and written text.

The North Carolina General Statutes declare that the channel and a portion of the floodplain of all the state's streams will be designated as a floodway, either by the local government or by the state. The legislatively declared purpose of designating these areas as a floodway is to help control and minimize the extent of floods by preventing obstructions which inhibit water flow and increase flood height and damage and other losses (both public and private) in flood hazard areas, and to promote the public health, safety, and welfare of citizens of Greenville in flood hazard areas. To carry out this purpose, The City of Greenville has established a Flood Damage and Prevention Ordinance, which is Title IX, Chapter 6 of the Greenville City Code. The City is empowered to grant permits for the use of the floodways, including the placement of any artificial obstruction in the floodway,

however the development of land within the floodway, or the 100-year floodplain as identified by FEMA is restricted in accordance with State law. No permit is required for certain uses, including agricultural, wildlife and related uses; ground level uses such as parking areas, rotary aircraft ports; lawns, gardens, golf courses, tennis courts, parks, open space, and similar private and public recreational uses. The procedures that are laid out for issuing permits for floodway and 100-year floodplain use require the City of Greenville to consider the dangerous effects a proposed artificial obstruction may create by causing water to be backed up or diverted; or the danger that the obstruction will be swept downstream to the injury of others; and by the injury or damage that may occur at the site of the obstruction itself. The Flood Damage and Prevention Ordinance takes into account anticipated development in the foreseeable future, which may be adversely affected by the obstruction, as well as existing development.

The importance of the planning powers of Greenville is emphasized in N.C.G.S. 160A-383. While the ordinances themselves may provide evidence that zoning and floodplain development are being conducted "in accordance with a plan," the existence of a separate planning document ensures that the City is developing regulations and ordinances that are consistent with the overall goals of the community. The City of Greenville's Comprehensive Plan is known as Horizons, which serves as Greenville's guide for future development considerations. The goals, objectives and strategies of Greenville's Horizons plan will be discussed in greater detail later in the plan as they relate to hazard mitigation strategies more specifically.

Subdivision regulations control the division of land into parcels for the purpose of building development or sale. Flood-related subdivision controls typically require that subdividers install adequate drainage facilities, and design water and sewer systems to minimize flood damage and contamination. They prohibit the subdivision of land subject to flooding unless flood hazards are overcome through filling or other measures and prohibit filling of floodway areas. They require that subdivision plans be approved prior to the sale of land. Subdivision regulations are a more limited tool than zoning and only indirectly affect the type of use made of land or minimum specifications for structures. Broad subdivision control enabling authority for Greenville is granted in N.C.G.S. 160-371. Subdivision is defined as all divisions of a tract or parcel of land into two or more lots and all divisions involving a new street (N.C.G.S. 160A-376). The definition of subdivision does not include the division of land into parcels greater than 10 acres where no street right-of-way dedication is involved.

❖ *ACQUISITION OF PROPERTY*

The power of acquisition can be a useful tool for pursuing mitigation goals. The City of Greenville may find the most effective method for completely "hazard-proofing" a particular piece of property or area is to acquire the property (either in fee or a lesser interest, such as an easement), thus removing the property from the private market and eliminating or reducing the possibility of inappropriate development occurring. North Carolina legislation empowers cities, towns, and counties to acquire property for public purpose by gift, grant, devise, bequest, exchange, purchase, lease, or eminent domain.

❖ *TAXATION*

Taxation is yet another power granted to the City of Greenville by North Carolina law which can be used as a hazard mitigation tool. Greenville currently has an annual property tax revenue of $3.4 million. However, the power of taxation extends beyond merely the collection of revenue. Greenville has a set preferential tax rate for areas, which are unsuitable for development (e.g., agricultural land, wetlands) and can be used to discourage development in hazardous areas.

Greenville also has the authority to levy special assessments on property owners for all or part of the costs of acquiring, constructing, reconstructing, extending, or otherwise building or improving beach erosion control or flood and hurricane protection works within a designated area. This can serve to increase the cost of building in such areas, thereby discouraging development.

Because the usual methods of apportionment seem mechanical and arbitrary, and because the tax burden on a particular piece of property is often quite large, the major constraint in using special assessments is political. Special assessments seem to offer little in terms of control over land use in developing areas. They can, however, be used to finance the provision of services the City deems necessary within its boundaries. In addition, they are useful in distributing to the new property owners the costs of the infrastructure required by new development.

❖ *SPENDING*

Spending is the power Greenville is given to make expenditures in the public interest. Hazard mitigation principles should be made a routine part of all spending decisions made by the local government, including annual budgets and Capital Improvement Plans.

A capital program is usually a timetable by which a city indicates the timing and level of municipal services it intends to provide over a specified duration. Capital programming, by itself, can be used as a growth management technique, with a view to hazard mitigation. By tentatively committing itself to a timetable for the provision of capital to extend municipal services, a community can control its growth to some extent especially where the surrounding area is such that the provision of on-site sewage disposal and water supply are unusually expensive.

In addition to formulating a timetable for the provision of services, a local community can regulate the extension of and access to municipal services.

The City of Greenville has an active Capital Improvement Program (CIP) that is coordinated with extension and access policies, and can provide a significant degree of control over the location and timing of growth. These tools can also influence the cost of growth. If the CIP is effective in directing growth away from environmentally sensitive or high hazard areas, for example, it can reduce environmental costs.

❖ *FISCAL CAPABILITY*

There are many diverse sources of funding available to communities to implement local hazard mitigation plans, including both government and private programs. Often an organization with a particular focus will fund only part of a project. However, with coordination, the community can combine the funding efforts of one program with those of another, thereby serving multiple missions. The grant and loan programs described in the following two pages of this plan are a significant, although certainly not a sole source of funding options.

While federal and national programs carry out the bulk of disaster relief programs that provide funds for mitigation, local governments are encouraged to open the search field as widely as possible, and include alternative funding sources to supplement the local hazard mitigation budget. For instance, Greenville businesses and organizations will frequently support projects that benefit their customers or employees, or which constitute good "PR." Other groups or individuals may be willing to donate "in-kind" services, eliminating the need for cash. Often the in-kind and volunteer services of local community members can be counted toward the local share that is typically needed to match an outside source of funds.

Greenville may also engage in its own "fund-raising" efforts to pay for mitigation programs that benefit the community at large. In North Carolina, local governments are granted limited powers to raise revenue for public purpose. The General Assembly has given the City of Greenville the power to levy property taxes for various purposes, including: "ambulance services, rescue squads, and other emergency medical services; civil defense; drainage projects or programs; fire protection; hospitals; joint undertakings with other county, city, or political subdivisions; planning; sewage; solid waste; water; water resources; watershed improvement projects" N.C.G.S. §16A-209. These statutorily enumerated purposes make it clear that Greenville is empowered to finance certain emergency management activities, including mitigation activities, with property taxes.

The following is a list and description of several programs, which offer funding for hazard mitigation, redevelopment, and post disaster recovery:

- **Hazard Mitigation Grant Program**

  The Federal Disaster Assistance Act (Stafford Act) provides funds authorized by the federal government and made available by FEMA for a cost-share program to states. The HMGP provides 75% of the funds while the states provide 25% of the funds for mitigation measures through the post-disaster planning process. The Division of Emergency Management administers the program in this state. The state share may be met with cash or in-kind services. The program is available only for areas affected by a Presidentially-declared disaster. The City of Greenville specifically used HMGP funds to buy-out the majority of severely flooded properties after Hurricane Floyd under the circumstances that residential units were located within the 100-year floodplain, the properties were occupied by either the owner, a tenant, or were available for sale or rent at the time of the flood, or the property was damaged to at least 50 percent of its fair market value or declared to be environmentally uninhabitable. The City's HMGP process was administered by City Planners in the Flood Recovery Center. The City purchased a total of about 491 properties

using $27.8 million dollars of federal grant money in buy-out and demolition expenses. The first phase of the City's HMGP application after Floyd was approved on December 15, 1999. Based on this program the City created its Flood Land Reuse Plan, which generates a lease system for use and maintenance of these properties based on certain restrictions placed on them by FEMA. The Flood Land Reuse Plan sets forth significant policies in the way of hazard mitigation, and will be discussed later in this plan.

- **Disaster Preparedness Improvement Grant (DPIG)**

This grant provides federal matching funds for communities to develop hazard mitigation plans, expand existing plans, update disaster preparation plans, and to prepare the administrative plans required to qualify for Hazard Mitigation Grant Program grants. Funds for the DPIG are provided by FEMA and the Division of Emergency Management administers the program in each state. The City of Greenville specifically has no record of using these funds. However it is important to note that Greenville could have this option if the plan needed to be updated and there was a shortage of staff to complete the assignment.

- **Flood Mitigation Assistance Program (FMAP)**

This program provides grants for cost-effective measures to reduce or eliminate the long-term risk of flood damage to the built environment and real property. The program's main goal is to reduce repetitive losses to the National Flood Insurance Program. The FMAP is available to eligible communities every year, not just after a Presidentially-declared disaster. Funds for the FMAP are provided by FEMA and the Division of Emergency Management administers the program in each state. These funds were not specifically used by the City of Greenville after Hurricane Floyd, but its important to note their significance.

- **Public Assistance Program (PA)**

The Public Assistance provides federal aid to communities to help save lives and property in the immediate aftermath of a disaster and to help rebuild damaged facilities. Grants cover eligible costs associated with the repair, replacement, and restoration of facilities owned by state and local governments and nonprofit organizations. The Public Assistance program is administered by FEMA.

- **Small Business Administration Disaster Assistance Program**

This program provides loans to businesses affected by Presidentially-declared disasters. The program provides direct loans to businesses to repair or replace uninsured disaster damages to property owned by the business, including real estate, machinery and equipment, inventory and supplies. Businesses of any size are eligible. Nonprofit organizations are also eligible. The SBA administers the Disaster Assistance Program. In the City of Greenville, the SBA Loan program was administered by East Carolina University, which also had a Flood Recovery Center set up at their Willis Building. The City's Relocation Specialist served as a referral source for these loans for businesses that needed assistance.

- **Housing Crisis Assistance Funds**

  Under The Hurricane Floyd Recovery Act of 1999 created under the North Carolina Department of Commerce, Greenville applied for infrastructure grant funds to service two (2) single-family subdivisions for home-owners and tenants affected by the storm. The first of which, known as Countryside Estates, contains 105 lots. The other is known as Meadowbrook estates containing 85 lots, which was constructed by a private developer. The Flood Recovery Center administered this grant. Overall, $1.9 million dollars in infrastructure grants were utilized for the development of these homes. The City of Greenville Community Development Department continues to maintain and keep records of the homes being sold in these subdivisions.

- **Community Development Block Grant (CDBG)**

  The United States' Housing and Urban Development (HUD) Community Development Block Grant (CDBG) program provides grants to entitlement communities (metropolitan cities and urban counties), and the State of North Carolina for post-disaster hazard mitigation and recovery following a presidential declaration of a Major Disaster of Emergency. Funds can be used for activities such as acquisition, rehabilitation, or reconstruction of damaged properties and facilities and redevelopment of disaster-affected areas. Funds may also be used for emergency response activities, such as debris clearance and demolition and extraordinary increases in the level of necessary public services. The City of Greenville is considered an entitlement community and has an active Home Consortium Plan and CDBG Program. CDBG funds were utilized to administer the Repair and Replacement program which assisted home-owners located within the 500-year floodplain that were severely affected by Hurricane Floyd. Planners in the Flood Recovery Center administered the Repair and Replacement grant, and maintained files on the use of these funds.

E. TECHNOLOGICAL CAPABILITIES

As mentioned in the staff capability section, Greenville has full-time employees that work in the Information Technology (IT) Department. The IT Department contains four divisions: The Development Division, the Systems Analysis Division, the Support Division, and the Geographic Information Services (GIS) Division. Through IT, the City of Greenville has full internet capabilities, and the ability to use Microsoft Office products through a Hummingbird DOCS System for security. An AS 400 HTE system is used for payroll records, accounting and financial services. The Planning and Community Development Department does not use the AS 400 system for any other reasons except payroll. The primary email client is Lotus Notes, and Greenville has full GIS capabilities through ArcGIS 8.3, which includes Arc Map, Arc Toolbox and Arc Catalog. The Department of Planning and Community Development contains a Planner II – GIS Specialist that maintains and creates data layers for use primarily by the Planning Department, but also for other departments such as Public Works.

The Planning and Community Development Department is divided into three primary divisions including Current Planning, Long Range Planning, and Community Development. This Hazard Mitigation Plan is being written, administered, and maintained by the Long Range Planning division.

Other long-range plans include Horizons: Greenville's Comprehensive Plan, the 2004 Greenway Master Plan, the Flood Land Reuse Plan, and the Center City Redevelopment Plan, which is currently in process. Changes to this plan and comments on other arrangements as they relate to this plan will be reviewed by some of the commissioned bodies as previously mentioned, including the Environmental Advisory Commission, Planning and Zoning Commission, and the City Council.

F. POLITICAL CAPABILITIES

Within the Department of Planning and Development, the City has written documents and plans that outline many policies and objectives the City will follow in instances of environmental protection and quality. The City's Environmental Advisory Commission operates in this capacity by making recommendations to City Council. Flood protection in general has become a major political issue since the citizens of Greenville have seen first hand the impact of major natural disasters. Greenville advances hazard mitigation through plans and ordinances more than by any other method. Greenville's Horizons plan gives detailed political descriptions of the importance of preserving flood hazard areas, and increasing awareness to citizens on the effects of a major flood. The Flood Land Reuse Plan serves as another political guidance tool that displays facts about what was lost, and explains that future uses should have a low flood damage potential. A mitigation strategy of this plan is that the City of Greenville should make efforts to increase its political capabilities by establishing small area plans that carry out goals of long range environmental plans, and by increasing awareness to the public. The City also works with other agencies, as mentioned throughout this plan, such as East Carolina University in order to establish a good political climate.

END OF SECTION

HAZARD IDENTIFICATION & VULNERABILITY

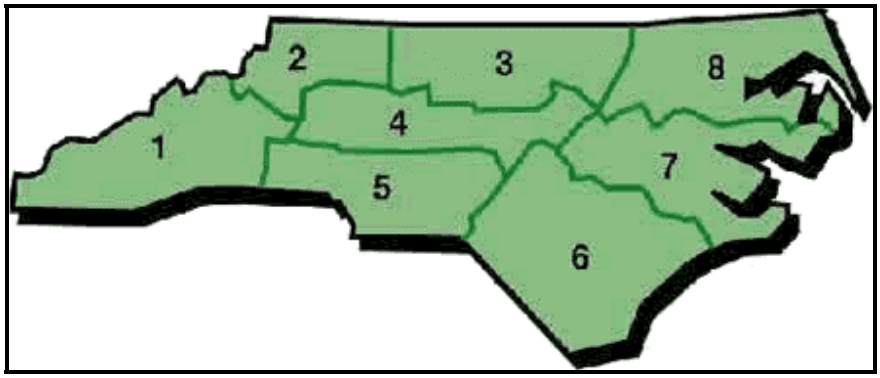
A. POTENTIAL HAZARDS

North Carolina is faced with many risks from different sources of natural disasters. Some areas may have different impacts and vulnerability to certain hazard events whereas others may not. Due to its unique geographical setting, The City of Greenville is vulnerable to a wide array of natural disasters that threaten life and property. Prior to determining which specific hazards the City of Greenville should focus on, Greenville needs to know the type of natural hazards that threaten the City, the likelihood of occurrence of the hazards, the impact of the hazard, and the strength of the hazard. These hazards include:

- ***FLOODING***
- ***HURRICANES & TROPICAL STORMS***
- ***TORNADOES***
- ***SEVERE THUNDERSTORMS***
- ***SEVERE WINTER STORMS***
- ***NOR'EASTERS***
- ***WILDFIRES***
- ***EARTHQUAKES***

Greenville's vulnerability to these hazards is similar to Pitt, Hyde, Beaufort, Jones, Lenoir, Johnston, Greene, Craven, Carteret, Pamlico and Wayne Counties, including their municipalities because they are located within climate division 7 identified by the National Climatic Data Center for the State of North Carolina.

Map 3:
Climate Divisions of North Carolina



Source: Division of Emergency Management (www.dem.dcc.state.nc.us/mitigation/local_hazards.htm)

Some of these hazards are interrelated (i.e., hurricanes can cause flooding and tornadoes), and some consist of hazardous elements that are not listed separately (i.e., severe thunderstorms can cause lightning and nor'easters can cause coastal erosion). Pitt County and the City of Greenville are more vulnerable to hurricanes, nor'easters, flooding, thunderstorms, and tornadoes than to earthquakes, severe winter storms and wildfires, although these will all be addressed by this plan. Dam/Levee Failures, Drought/Heat Waves, and Landslides are disasters that are identified by FEMA that have no historical impact in the City of Greenville or Pitt County. This plan will not discuss tsunamis or volcanoes due to their low-likelihood of occurrence, and it is not intended to address man-made disaster risks such as chemical spills, civil disorder, terrorism, and the like. The reader is encouraged to refer to the City of Greenville Police Department's Emergency Operations Manual for information regarding responses to man-made disaster events.

❖ *FLOODING*

♦ Description

Flooding is the most frequent and costly natural disaster in the United States. Floods are generally the result of excessive precipitation, and can be classified under the following categories:

Flash flooding events usually occur within minutes or hours of heavy amounts of rainfall, from a dam or levee failure, or from a sudden release of water held by an ice jam. Most flash floods are cause by slow-moving thunderstorms or heavy rains associated with a hurricane or tropical storm. Although flash flooding occurs more frequently around mountain streams, it is also common in an urbanized area where impervious surface cover covers the ground for the most part. Nationally, July is the month in which most flash floods occur, and nearly 90% of flash floods occur during the April through September period.

General floods are usually longer-term events that may last for several days over a given river basin. The severity of a flooding event is determined by a combination of stream and river basin topography and physiography, precipitation and weather patterns, recent soil moisture conditions and the degree of vegetative clearing.

Riverine flooding is a function of excessive precipitation levels and water runoff volumes within the watershed or basin of a stream or river.

Coastal flooding is typically a result of storm surge, wind-driven waves, and heavy rainfall produced by hurricanes, tropical storms, nor'easters and other large coastal storms.

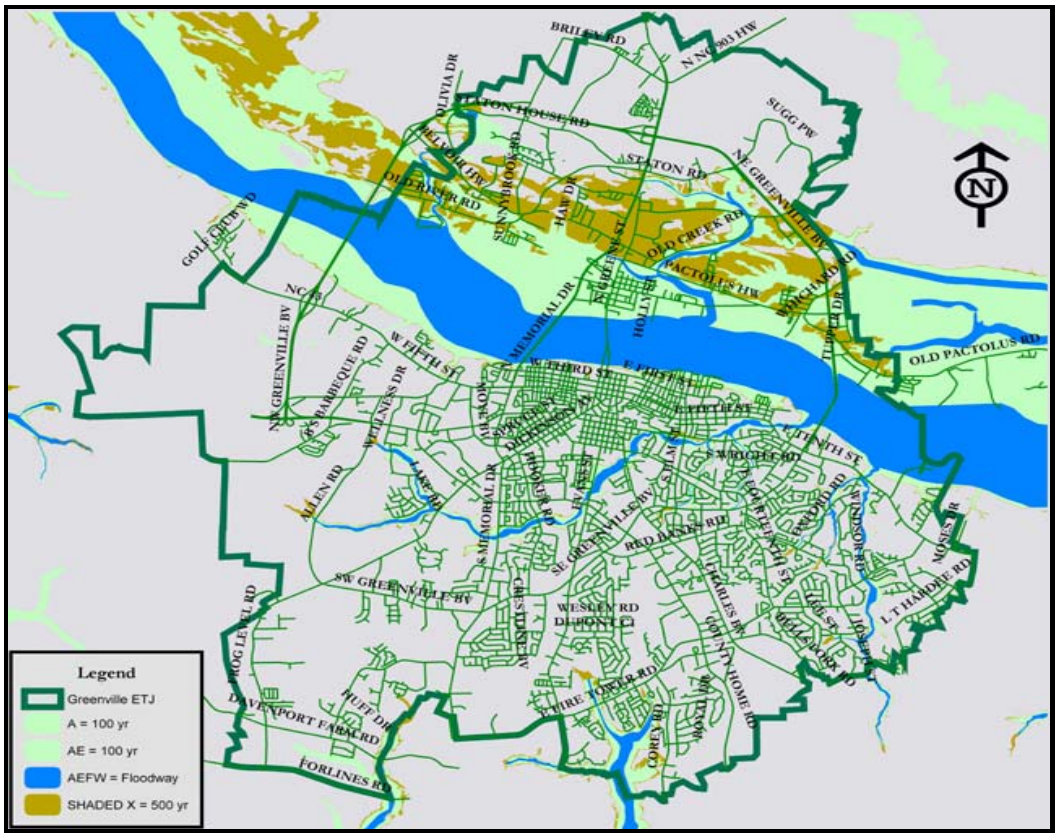
Urban flooding occurs where man-made developments obstruct the natural flow of water and/or decrease the ability of natural ground cover to absorb and retain surface water runoff. This is partly the result of the use of waterways for transportation purposes provided as a source of convenience to ship and receive commodities.

Periodic flooding of lands adjacent to rivers, streams and shorelines is a natural occurrence that can take place based upon established recurrence intervals. The recurrence interval of a

flood is defined as the average time interval (years) expected between a flood event of a particular magnitude and an equal or larger flood. Flood magnitude increases with increasing recurrence intervals.

A "floodplain" is the lowland area adjacent to a lake, river, stream or ocean. Floodplains are identified by the frequency of a flood event that is large enough to cover them. For example, the 100-year floodplain will most likely be completely flooded at the occurrence of a 100-year flood. The 100-year flood frequency is determined by plotting a graph of the size of all known floods for an area, and determining how often floods of a particular size will occur. Another way of expressing the flood frequency is to determine the probability within a given year. For example, the 100-year flood has a 1% chance of occurring in a given year. Most floodplains have three main zones including the floodway, which is basically the stream ditch or extent of the channel, the 100-year floodplain, and 500-year floodplains. In some cases, the 100-year floodplain as classified by FEMA has a category A and AE. Category A is an area that may experience the 100-year flood, but does not have specific reference data on elevations. The 500-year floodplain is most often known as zone X.

Map 4:
Floodplain Map: This map indicates the location of the City of Greenville's floodplain



The severity of a flooding event is usually determined by a combination of river basin physiography, local thunderstorm movement, past soil moisture conditions, and the degree

of vegetative clearing. Abnormal weather patterns may also contribute to flooding of local areas. Large-scale climatic events such as the El-Nino-Southern Oscillation in the Pacific Ocean have been linked to increased storm activity and flooding in the United States.

- **Likelihood of Occurrence**

Flood Hazards vary by location and type of flooding. Inland areas are most at risk to flash floods caused by intense rainfall over short periods of time. Urban areas are particularly susceptible to flash floods. Large amounts of impervious surfaces increase runoff amounts and decrease lag time between the onset of rainfall and stream flooding. Man-made channels may also constrict stream flow and increase flow velocities.

The dominant sources of flooding in Greenville are riverine flooding from the Tar River, located within the Tar-Pamlico River Basin, and it's tributaries mainly Green Mill Run, and Hardee Creek/Bells Branch. Greenville also suffers from urban stormwater related flooding as impervious surface is increased. The entire City is relatively flat with most ground elevations at or below 25 feet above sea level.

- **Historical Impact and Occurrences**

The floodplain areas as depicted on Map 2 are the historical focus of most flooding within the City of Greenville. 500-year floodplain areas have also suffered from flooding. Floodplain areas north of the Tar River have suffered from more severe flooding historically, while floodplain areas to the south have suffered more frequently but less severe. Severe thunderstorms and Nor'easters over the years have distributed large amounts of rainfall, but Tropical Storms and Hurricanes that bring high winds and large amounts of precipitation have the greatest probability to cause flooding.

Flash Flood/Tropical Storm Josephine (October 8, 1996) – The remnants of Tropical Storm Josephine dumped as much as six inches of rain on Eastern North Carolina. Reportedly, Greenville suffered very little from these flash floods, but did record numbers for some property damages.

Tropical Storm Dennis/Hurricane Floyd (August through September, 1999) – The City of Greenville and Eastern North Carolina suffered from the worst flooding in recorded history as a result of the combination of Tropical Storm Dennis and Hurricane Floyd. On August 30, 1999, Hurricane Dennis approached North Carolina as a category 2 hurricane, but quickly down graded to a tropical storm. This first wave of Tropical Storm Dennis left little impact on the City of Greenville specifically, but did produce lots of rain that raised the elevations of the Tar River and its tributaries. On September 4, 1999, Tropical Storm Dennis returned to Eastern North Carolina dumping very heavy rains. With the ground unable to absorb any more rainfall, Hurricane Floyd swept through the area on September 15, 1999 and dumped as much as twenty inches of precipitation in some areas of Greenville. Due to the fact that the Tar River and its tributaries were already swollen to their limits, the floodwaters engulfed almost all of the area within the 100 and 500-year floodplains. The flood impacted approximately 1,893 total structures (see table 4). Many of the affected structures within Greenville's jurisdiction remained submerged for nearly two weeks. Of

these structures, approximately 55% were deemed uninhabitable and 45% in need of repair. Monetary losses for the City of Greenville and its residents are estimated as follows: $23.5 million dollars in damages to city-owned properties, $65.5 million dollars to private residential and commercial properties, and over $2.5 million dollars in personal property damages.

Table 4:
Classification of Damaged Structures

STRUCTURE TYPE	TOTAL	% OF TOTAL
Single-Family Detached	404	21.3%
Manufactured Homes	642	33.9%
Multi-Family Units	501	26.4%
Duplex Units	206	10.9%
Commercial Structures	140	7.5%
Total Structures	**1,893**	**100%**

Image 1:
Flooded View of Highway 264 Bypass

Image 2:
Flooded View of Pinecrest MHP

❖ *HURRICANES & TROPICAL STORMS*

♦ Description

Hurricanes are cyclonic storms that originate in tropical ocean waters pole ward of about 50 degrees N. latitude. Basically, hurricanes are heat engines, fueled by the release of latent heat from the condensation of warm water. Their formation requires a low-pressure disturbance, sufficiently warm sea surface temperature, rotational force from the spinning of the Earth, and the absence of wind shear in the lowest 50,000 feet of the atmosphere.

Hurricanes that impact North Carolina form in the so-called Atlantic Basin, from the west coast of Africa westward into the Caribbean Sea and Gulf of Mexico. Hurricanes in this basin generally form between June 1 and November 30, with a peak around mid-September. As a hurricane develops, barometric pressure at its center falls and winds increase. Winds at or exceeding 39 mph result in the formation of a tropical storm, which is given a name and closely monitored by the NOAA National Hurricane Center in Miami, Florida. When winds are at or exceed 74 mph, the tropical storm is deemed a hurricane.

Because hurricanes derive their strength from warm ocean waters, they are generally subject to deterioration once they make landfall. The forward momentum of a hurricane can vary from just a few miles per hour to up to 40 mph. This forward motion combined with a counterclockwise surface flow makes the right front quadrant of the hurricane the location of the most potentially damaging winds.

Table 5:
Saffir-Simpson Scale

Category	Max. Sustained Wind Speeds (mph)	Min. Surface Pressure (millibars)	Storm Surge (feet)
1	74-95	Greater than 980	3 to 5
2	96-110	979-965	6 to 8
3	111-130	964-945	9 to 12
4	131-155	944-920	13 to 18
5	155+	Less than 920	19+

Hurricane intensity is measured using the Saffir-Simpson Scale (Table 5 above), ranging from 1 (minimal) to 5 (catastrophic). This scale categorizes hurricane intensity linearly based upon maximum sustained winds, minimum barometric pressure and storm surge

potential, which are combined to estimate potential damage. Categories 3, 4 and 5 are classified as "major" hurricanes, and while hurricanes within this range comprise only 20% of total tropical cyclone landfalls, they account for over 70% of the damage in the United States. Table 6 describes the damage that could be expected for each type of hurricane.

Table 6:
Hurricane Damage Classification

Category	Damage Level	Description
1	MINIMAL	No real damage to building structures. Damage primarily to unanchored mobile homes, shrubbery, and trees. Also, some coastal flooding and minor pier damage
2	MODERATE	Some roofing material, door and window damage. Considerable damage to vegetation, mobile homes, etc. Flooding damages piers and small crafts in unprotected moorings.
3	EXTENSIVE	Some structural damage to small residences and utility buildings, with a minor amount of curtainwall failures. Mobile homes are destroyed. Flooding near the coast destroys smaller structures with larger structures damaged by floating debris. Terrain may be flooded well inland.
4	EXTREME	More extensive curtainwall failures with some complete roof structure failure on small residences. Major erosion of beach areas. Terrain may be flooded well inland.
5	CATASTROPHIC	Complete roof failure on many residences and industrial buildings. Some complete building failures with small utility buildings blown over or away. Flooding causes major damage to lower floors of all structures near the shoreline. Massive evacuation of residential areas may be required

Source: National Hurricane Center

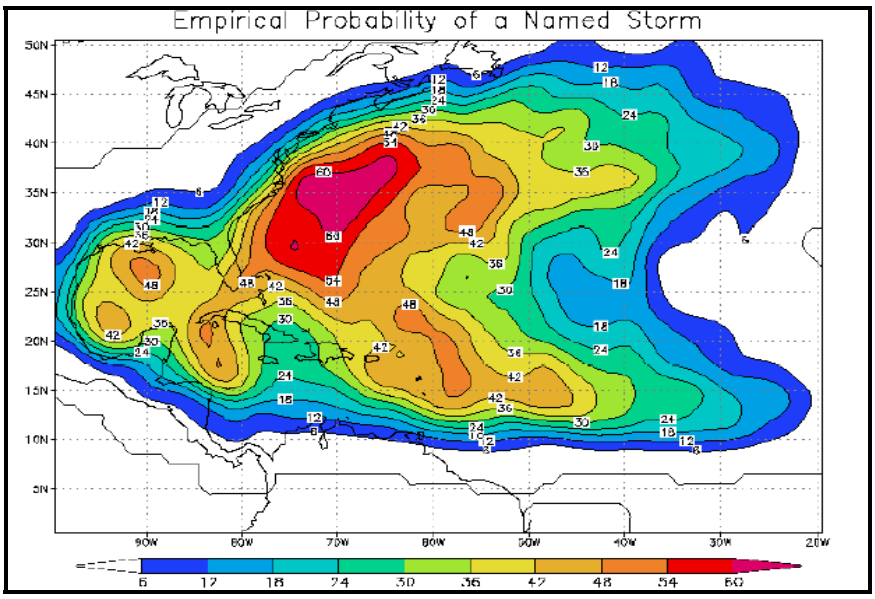
Damage during hurricanes may also result from spawned tornadoes and inland flooding associated with heavy rainfall, which can accompany these storms. Hurricane Floyd for example, as mentioned above will be remembered for causing the worst inland flooding disaster in North Carolina's history.

- **Likelihood of Occurrence**

North Carolina's geographic location on the Atlantic Ocean, and its proximity to the Gulf Stream makes it prone to hurricanes. In fact, North Carolina experienced the

fourth greatest number of hurricane landfalls of any state in the twentieth century (trailing Florida, Texas, and Louisiana).

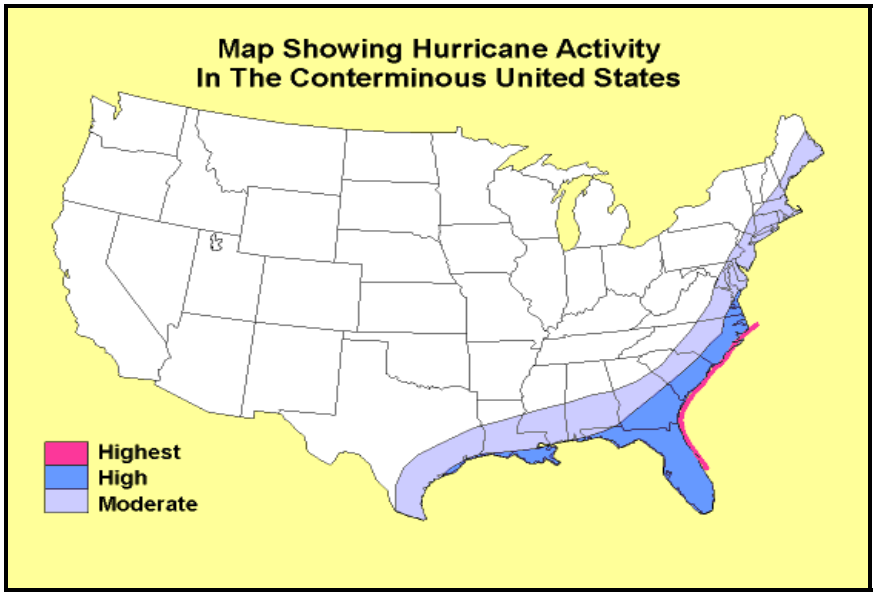
Image 3:
Probability of a Tropical Storm or Hurricane during the season from June to November



Source: NOAA, Hurricane Division: Todd Kimberlain

Based on this chart, Greenville and Pitt County have about a 30 to 36% chance of being affected by a Tropical Storm or Hurricane during the Hurricane Season.

Map 5:
Hurricane Activity Analysis *(Source: USGS)*



Map 5 from the United States Geological Survey portrays hurricane activity in the United States and as you can see, North Carolina's coastline and inner Coastal Plain areas are most at risk.

- **Historical Impact and Occurrences**

North Carolina has a long and notorious history of destruction by hurricanes. Ever since the first expeditions to Roanoke Island in 1586, hurricanes are recorded to have caused tremendous damage to the state. The state's protruding coastline makes it a favorable target for tropical cyclones that curve northward in the western Atlantic Ocean. Reliable classification of the intensity of tropical cyclones began in 1886. Since that time, there have been 951 tropical cyclones that have been recorded in the Atlantic Ocean and the Gulf of Mexico. Approximately 166 or 17.5% of those tropical cyclones passed within 300 miles of North Carolina. According to the State Climate Office of North Carolina, 38 tropical cyclones have made direct landfall in North Carolina since 1886. Of these, 10 were tropical storms, 22 were minor hurricanes and 6 were major hurricanes. Another 56 tropical cyclones have impacted North Carolina since 1886 by either entering from another state or by passing in proximity to the coast but remaining offshore. Of these, 41 were tropical storms, 8 were minor hurricanes and 7 were major hurricanes. According to the State Climate Office, the coast of North Carolina can expect to receive a landfalling tropical cyclone once every four years and be affected by one every 1.3 years.

September, 1999 dates the most costly hurricane to ever hit North Carolina, **Hurricane Floyd.** As mentioned in the previous section, Hurricane Floyd made landfall as a Category II storm near Topsail Island and its progression inland resulted in unprecedented, widespread flooding across Eastern North Carolina and Greenville. Damage from Floyd was worse than might have been expected because of **Hurricane & Tropical Storm Dennis**, which had dropped as much as 8 inches of rain on Greenville just 10 days earlier. Rainfall amounts for Floyd were as high as 15 to 20 inches, and rivers across North Carolina rose as much as 23 feet above flood stage, shattering previously established flood records for many locales. Sixty-seven counties sustained damages, and there were a total 52 deaths. In total, the storm damaged more than 55,000 homes, 17,000 of which were left uninhabitable and another 7,000 destroyed. Total damage estimates exceeded 6 billion dollars. At least 13 fatalities were reported for the 15-county warning area that included Pitt County, along with $413.6 million dollars in crop damage and $410.6 million dollars in property damage. As mentioned in the previous section, Greenville suffered in property damage losses exceeding $91 million dollars. The buyout programs began shortly after, once all damaged property was analyzed. Severely damaged properties (damaged 50% or more, located within the 100-year floodplain, or deemed environmentally uninhabitable) were eligible to receive funding through the Hazard Mitigation Grant Program (HMGP). Other funding sources came through the State's Repair and Replacement Program, which gave specific assistance to owner-occupied properties located outside the 100-year floodplain that were affected. On December 15, 1999, the City of Greenville submitted its initial HMGP application to the North Carolina Division of Emergency Management for approval. The City was notified on February 16, 2000 that Phases I and II were approved by the State and the Federal Emergency Management Agency (FEMA). Total expenses for Phases I and II

equaled approximately $9,812,659 for a total of 181 properties. Phase III was originally approved in November of the same year, but has gone through several amendments. The numbers for Phase III payments as of November of 2003 were approximately $17,995,639.

1996 was another rare year in the hurricane history of North Carolina. Tropical Storm Arthur, Hurricane Bertha, and Hurricane Fran all made direct landfall on the North Carolina coastline. It was the most active tropical cyclone season in the state since 1955, when Hurricanes Connie, Diane, and Ione all hit the coast. **Tropical Storm Arthur** teased the North Carolina coast as a hurricane, and then headed up across Cape Lookout into the Pamlico Sound when it down graded to a tropical depression. Heavy rains fell across Greenville and Pitt County. Reportedly, this region suffered from around 1 million dollars in property damages. **Hurricane Bertha** slammed into the North Carolina coastline between Surf City and North Topsail Beach causing severe damage to property, utilities and roads. Peak wind gusts of 108 mph and a storm surge of 8-10 feet were recorded, and as much as 8 inches of rain fell across the region. Greenville experienced severe winds and rainfall associated with this storm. **Hurricane Fran** was especially destructive. Fran struck the coast as a Category three storm at Cape Fear on September 6, 1996, causing widespread damages and impacting sixty percent of the state. Flash flooding in the mountains, high winds and riverine flooding in the Piedmont and Coastal Plain, and a coastal storm surge of up to 12 feet took a heavy toll on residences, businesses and agriculture. The storm was responsible for 24 deaths and damaged more than 40,000 homes. Total damage estimates exceeded 3.2 billion dollars for the entire state. Next came **Tropical Storm Josephine** on October 8th, which affected Greenville mostly from a flash flooding standpoint. Greenville suffered from about 100,000 dollars in property damages as a result of this storm.

1953, 1954, and 1955 was the most active three-year period of tropical cyclones in the state's history. Over that period, six hurricanes made direct landfall in North Carolina. The most powerful hurricane to hit the state made landfall in 1954, **Hurricane Hazel**. It was the only category 4 hurricane to make landfall in North Carolina during the last century, resulting in 95 deaths and 2.8 million dollars in damages.

On August 28, 1998, Hurricane Bonnie approached the coast of North Carolina as a minimal Category 3 hurricane, but quickly weakened to Category 1 storm before making landfall near the Onslow/Pender county line. The storm then continued to move slowly northeast at speeds of 10 mph or less, dumping 7-10 inches of rain across eastern North Carolina. Since much of the region had experienced below normal rainfall during the summer months, the resulting flood was not as damaging as it could have been. Only minor injuries were recorded, along with approximately $6.4 million in property damage and $117 million in crop damage.

Hurricane Isabel was the latest storm to significantly affect North Carolina in September of 2003. Hurricane Isabel made landfall off the Core Sound Banks near Drum Inlet, and significantly impacted areas of Carteret County and other Counties along the coast. Greenville was affected by the high winds and rainfall of Hurricane Isabel.

❖ *TORNADOES*

♦ Description

A tornado is a violent windstorm characterized by a twisting, funnel-shaped cloud extending to the ground. It is most often generated by a thunderstorm (but sometimes result from hurricanes or nor'easters) and produced when cool, dry air intersects and overrides a layer of warm, moist air forcing the warm air to rise rapidly. The damage from a tornado is a result of the high wind velocity and wind-blown debris, although they are commonly accompanied by large hail as well. The most violent tornadoes have rotating winds of 250 miles per hour or more and are capable of causing extreme destruction, including uprooting trees and structures, and turning normally harmless objects into deadly missiles. Most tornadoes are just a few dozen yards wide and touch down only briefly, but highly destructive tornadoes may carve out a path over a mile wide and several miles long. The destruction caused by tornadoes may range from light to inconceivable depending on the intensity, size and duration of the storm. Structures of light construction, such as residential homes are more at risk to impacts.

Table 7:
Fujita-Pearson Scale: This scale is used to measure the impact of tornado strength based upon the amount of damage done *(Source: National Climatic Data Center)*

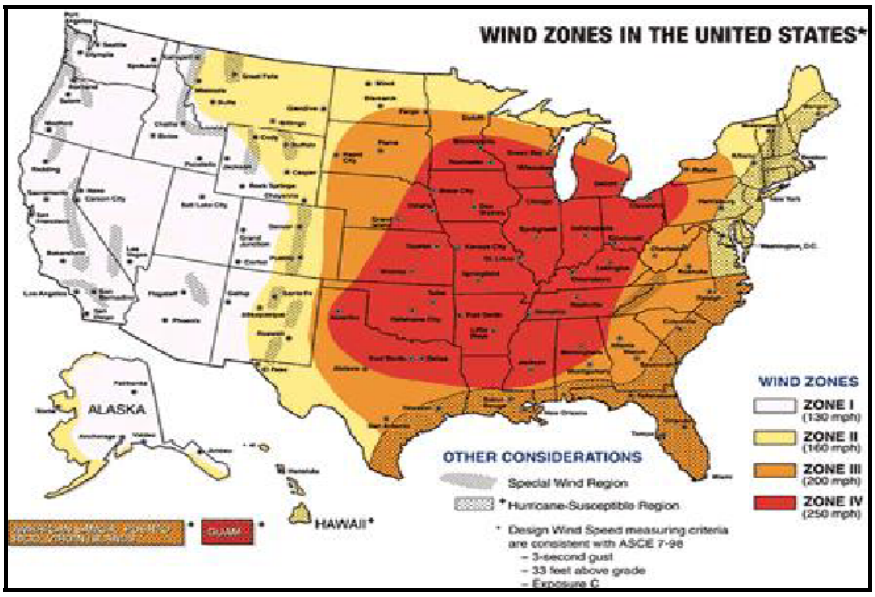
F-Scale	Intensity Phrase	Wind Speed	Damage Description
F0	**Gale Tornado**	**40-72 mph**	**Some damage to chimneys; breaks branches off trees; pushes over shallow-rooted trees; damages to sign boards**
F1	**Moderate Tornado**	**73-112 mph**	**Lower limit is the beginning of hurricane wind speed; peels surface off roots; mobile hames pushed off foundation; moving autos pushed off roads; attached garages destroyed.**
F2	**Significant Tornado**	**113-157 mph**	**Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light object missiles generated**
F3	**Severe Tornado**	**158-206 mph**	**Roof and some walls torn off well-constructed homes; trains overturned; most trees in forest uprooted/destroyed.**
F4	**Devastating Tornado**	**207-260 mph**	**Well-constructed houses leveled; structures w/ weak foundations blown off some distance cars thrown, large missiles generated.**

F5	**Incredible Tornado**	**261-318 mph**	**Strong frame houses lifted off foundations and carried considerable distances to disintegrate; automobile sized missiles fly through the air in excess of 100 meters; trees debarked; steel re-enforced concrete structures badly damaged**
F6	**Inconceivable Tornado**	**319-379 mph**	**These winds are very unlikely. The small area of damage they might produce would probably not be recognizeable. Missiles, such cars and refridgerators would do serious damage that could not be directly identified as F6 damage. If this level is ever achieved, evidence for it might only be found in some manner of ground swirl pattern, for it may never be identifiable through Eng. Studies.**

♦ **Likelihood of Occurrence**

Although tornadoes have been reported in Greenville throughout the year, most of them have occurred in the spring, with 13% in March, 11% in April, 22% in May, and 14% in June. Each year an average of 800-1000 tornadoes are reported nationwide, and they are more likely to occur during the spring and early summer months of March through June. Tornadoes are mostly likely to form in late afternoons and early evenings.

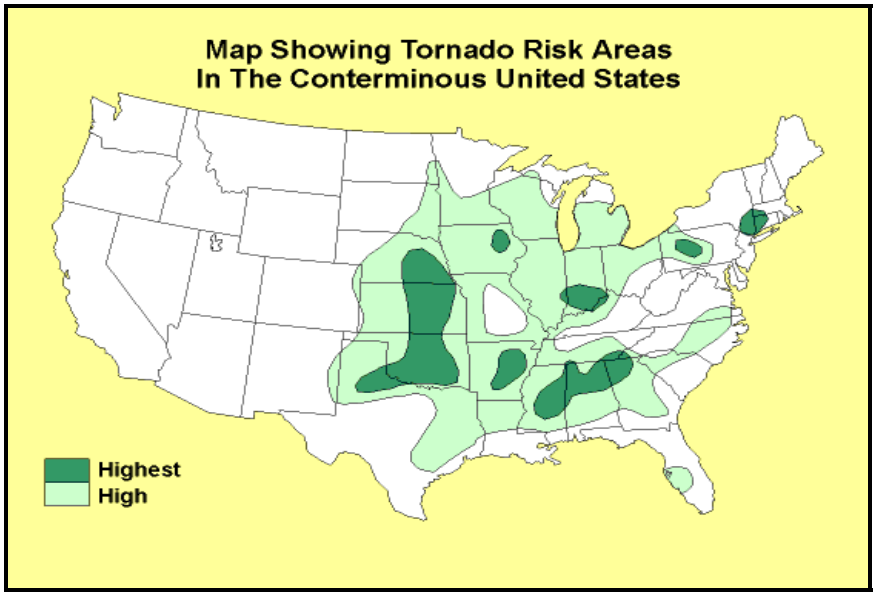
Map 6:
Wind Zones in the United States as identified by FEMA



Source: Federal Emergency Management Agency

Greenville and Pitt County lie within Wind Zone III (see Map 6) as identified by FEMA. Winds within this zone can potentially reach 200 miles per hour. In addition, Zone III includes all of the Coastal Plain of North Carolina, which is also susceptible to Hurricanes and Tropical Storms.

Map 7:
Tornado Risk Assessment in the United States



Source: United States Geological Survey

Map 7 shows the risk of tornado impacts in the United States. As you can see, North Carolina's Piedmont and a portion of the Coastal Plain areas have a high risk for a tornado. Greenville is located just outside this area. Tornadoes have and will occur in Greenville, however, and most of them will be caused by the relationship with other tropical storms. The tornadoes that will most likely affect Greenville normally will not exceed an F1 type storm.

- **Historical Impact and Occurrences**

Since the year 1950, 941 confirmed tornadoes were recorded in North Carolina. While many of these were in Pitt County, the vast majority occurred in Western Pitt County. Tornadic activity generally tends to diminish with increasing proximity to the coast. North Carolina in general ranks 22nd in the nation for frequency of tornadoes, 20th for number of deaths, 17th for injuries, and 21st for cost of damages.

March 28, 1984 marks the date that the largest and most devastating tornado outbreak occurred in North Carolina. This tornado outbreak covered nearly 250 miles across both North and South Carolina and became an F4 classification once it reached Pitt County. The Pitt County tornado touched down just a few miles to the northeast of La Grange and ripped through Lenoir and Greene Counties before reaching Pitt County between 8:45 and 8:55 PM. A total of 9 people in Pitt County lost their lives, 6 of which

coming from the east side of Greenville. In addition, this tornado injured about 153 people, and caused over $16 million dollars in property damages.

The following table outlines the tornadoes that have affected Greenville and Pitt County since 1950 with the 1984 storm highlighted:

Table 8:
Tornadoes in Pitt County since 1950

Location	Date	Magnitude	Deaths	Injuries	Property Damage
PITT	5/12/1950	F1	0	0	$345.8K
PITT	5/31/1950	F1	0	0	$34.6K
PITT	7/26/1950	F1	0	0	N/A
PITT	4/16/1953	F2	0	0	$312.2K
PITT	6/11/1955	F2	0	0	$3.1M
PITT	3/18/1956	F1	0	0	$30.6K
PITT	6/4/1959	F1	0	0	$286.4K
PITT	8/31/1964	F1	0	2	$2.7M
PITT	2/22/1971	F3	0	0	N/A
PITT	5/15/1972	F3	0	4	$5.0M
PITT	5/29/1973	F0	0	0	187.8K
PITT	2/23/1980	F0	0	0	N/A
Pitt/Greenville	3/28/1984	F4	9	153	$16.6M
Greenville	4/15/1996	F0	0	0	N/A
Greenville	4/15/1996	F1	0	0	$26.6K
Farmville	4/11/1999	F0	0	0	N/A

Source: National Climatic Data Center

❖ *SEVERE THUNDERSTORMS*

♦ Description

Severe thunderstorms are defined by the National Weather Service as storms that have wind speeds of 58 miles per hour or higher, produce hail at least three quarters of an inch in diameter, or produces tornadoes. In order to form, thunderstorms simply require moisture to form clouds and rain, coupled with an unstable mass of warm air that can rise rapidly. Thunderstorms affect relatively small areas when compared with hurricanes and winter storms, as the average storm is 15 miles in diameter and lasts an average of 30 minutes. Nearly 1,800 thunderstorms are occurring at any moment around the world, however, of the estimated 100,000 thunderstorms that occur each year in the United States only about 10 percent are classified as severe. Thunderstorms are most likely to happen in the spring and summer months and during the afternoon and evening hours, but can occur year-round and at all hours. Despite their small size, all thunderstorms are

dangerous and capable of threatening life and property in localized areas. Every thunderstorm produces lightning, which results from the buildup and discharge of electrical energy between positively and negatively charged areas. Each year, lightning is responsible for an average of 93 deaths (more than tornadoes), 300 injuries, and several hundred million dollars in damage to property and forests. Thunderstorms can also produce large, damaging hail, which causes nearly $1 billion in damage to property and crops annually. Straight-line winds, which in extreme cases have the potential to exceed 100 miles per hour, are responsible for most thunderstorm wind damage. One type of straight-line wind, the downburst, can cause damage equivalent to a strong tornado and can be extremely dangerous to aviation. Thunderstorms are also capable of producing tornadoes and heavy rain that can lead to flash flooding.

- **Likelihood of Occurrence**

Thunderstorms are common throughout North Carolina, and have occurred in all months. Thunderstorm-related deaths and injuries in North Carolina (1959-1992) have peaked during July and August. Thunderstorms are also capable of producing tornadoes and heavy rain that can lead to flash flooding. Likewise, Greenville is just as vulnerable to thunderstorms as any other areas in Eastern North Carolina. The most severe thunderstorms usually occur during summer months.

- **Historical Impact and Occurrences**

Severe thunderstorms are very common in Greenville, but very few of them actually cause significant damage.

Table 9:
Recent Thunderstorms in Areas of Pitt County

Location	Date	Event Type	Property Damage
Winterville	5/19/1993	Thunderstorm	$57.6K
Pitt County	1/7/1995	Thunderstorm	$82.6K
Black Jack	4/24/1995	Thunderstorm	$5.5K
Black Jack	5/2/1995	Thunderstorm	$54.7K
Grifton	5/19/1995	Thunderstorm	$54.7K
Farmville	11/11/1995	Thunderstorm	$54.7K
Greenville	11/11/1995	Thunderstorm	$54.7K
Ayden	11/11/1995	Thunderstorm	$54.7K
Simpson	11/11/1995	Thunderstorm	$54.7K
Winterville	11/11/1995	Thunderstorm	$54.7K
Greenville	1/19/1996	Tstm Wind	$21.2K
Calico	8/26/1996	Tstm Wind	$10.6K
Gardnerville	9/16/1996	Tstm Wind	$5.3K
Bruce	1/16/1997	Tstm Wind	$41.5K
Farmville	5/3/1997	Tstm Wind	$25.9K

Source: National Climatic Data Center

According to the National Climatic Data Center, there were 20 thunderstorms in Pitt County that actually produced numbers in property damage between 1993 and 1998. One specific storm on November 11, 1995 caused damage over a larger area of the County. Table 8 portrays this data.

❖ *SEVERE WINTER STORMS*

♦ Description

Severe winter storms can produce an array of hazardous weather conditions, including heavy snow, blizzards, freezing rain and ice pellets, and extreme cold. Severe winter storms are extra-tropical cyclones fueled by strong temperature gradients and an active upper-level jet stream. The winter storms that impact North Carolina generally form in the Gulf of Mexico or off the southeast Atlantic Coast. Few of these storms result in blizzard conditions, defined by the presence of the winds in excess of 35 mph, falling and blowing snow, and a maximum temperature of 20 degrees Fahrenheit. While the frequency and magnitude of snow events are highest in the mountains due to the elevation, the geographical orientation of the mountains and piedmont contribute to a regular occurrence of freezing precipitation events (e.g., ice pellets and freezing rain) in the piedmont.

♦ Likelihood of Occurrence

The entire State of North Carolina has a likelihood of experiencing severe winter weather. The threat varies by location and by type of storm. Coastal areas typically face their greatest threat from nor'easters and other severe winter coastal storms. These storms can contain strong waves and result in extensive beach erosion and flooding. Freezing rain and ice storms typically occur once every several years at coastal locations, and severe snowstorms have been recorded occasionally in coastal areas.

It is significant that when winter weather does hit the City of Greenville, it does have the potential of being severe. In 1997, FEMA commissioned the National Climatic Data Center (NCDC) to compile snowfall extreme statistics for the conterminous United States. One-day observed maximum total snowfall amounts (in inches) were compiled and consolidated by city. Out of the eight (8) total climate divisions in North Carolina, Greenville's climate division (#7) ranked third in terms of average one-day extreme snowfall.

♦ Historical Impact and Occurrences

While severe winter storms are a rarity in the City of Greenville, this very fact is one of the reasons they have such an impact on the population. Approximately three major storms in the last 20 years have resulted in power outages, immobilized traffic, and stranded people. Presidential disaster warnings for winter storms were declared in North Carolina in March of 1993, January 1996 and February 2000. Since 1993, 16 deaths and 190 injuries have been attributed to snow and ice events throughout the State, along with an estimated $137 million dollars in property damages. Snow and sleet occur on an

average of once or twice a year. In an average winter, snowfall ranges from about one inch to about nine inches. While most people can protect themselves from winter storms, livestock, crops, and real property bear the brunt of its force. Unprotected livestock, and even sheltered animals, if there are power failures, can be destroyed or injured sufficiently to lose commercial value. Winter grain and fruit trees succumb to ice storms and the loss of power, communication, and the immobilization of traffic represent a financial loss to industry. However, the main effect of winter storms in Greenville is immobility.

One specific storm is noted, on January 19, 1998, low pressure intensified off the South Carolina Coast and produced snow across much of Eastern North Carolina. Totals ranged from 4 inches in Martin and Pitt Counties to a trace along the coast. Numerous accidents were reported as vehicles slid into ditches.

❖ *NOR'EASTERS*

♦ Description

In the past decade, research meteorologists have recognized the significance of nor'easters and their potential to cause damage along the coast. Unlike hurricanes, these storms are extra-tropical, deriving their strength from horizontal gradients in temperature.

The presence of the warm Gulf Stream waters off the eastern seaboard during the winter acts to dramatically increase surface horizontal temperature gradients within the coastal zone. During winter offshore cold periods, these horizontal temperature gradients can result in rapid and intense destabilization of the atmosphere directly above and shoreward of the Gulf Stream. This period of instability often precedes wintertime coastal extra-tropical cyclone development.

It is the temperature structure of the continental air mass and the position of the temperature gradient along the Gulf Stream that drives this cyclone development. As a low pressure deepens, winds and waves can uninhibitedly increase and cause serious damage to coastal areas as the storm generally moves to the northeast. The proximity of North Carolina's coast to the Gulf Stream makes it particularly prone to nor'easters.

♦ Likelihood of Occurrence

Although nor'easters are more diffuse and less intense than hurricanes, they occur more frequently and cover larger areas and longer coastal reaches at one time. As a result, North Carolina is as much at risk to a nor'easter as it is any other tropical storm event. However, the most significant damage shown by a nor'easter occurs at the coast. Therefore, Greenville is at risk to weather associated with a nor'easter, but the impact of the damage done is much less than that of a tropical storm or hurricane. Greenville mainly sees the high winds associated with nor'easters. Nor'easters occurring during the winter months may produce an accumulation of snow and/or ice.

Analysis of nor'easter frequency by researchers reveals fewer nor'easters during the 1980s. However, the frequency of major nor'easters (class 4 and 5 on the Dolan-Davis scale – see table 10) has increased in recent years. In the period 1987 to 1993, at least one class 4 or 5 storm has occurred each year along the Atlantic seaboard of the United States, a situation duplicated only once in the last 50 years.

Table 10:
The Dolan-Davis Nor'easter Intensity Scale

Storm Class	Beach Erosion	Dune Erosion	Overwash	Property Damage
1 (Weak)	Minor changes	None	No	No
2 (Moderate)	Modest; mostly to lower beach	Minor	No	Modest
3 (Significant)	Erosion extends across beach	Can be significant	No	Loss of many structures at local level
4 (Severe)	Severe beach erosion & recession	Severe dune erosion or destruction	On low beaches	Loss of structures at community-scale
5 (Extreme)	Extreme beach erosion	Dunes destroyed over extensive areas	Massive in sheets and channels	Extensive at regional-scale; millions of dollars

Source: North Carolina Division of Emergency Management

- **Historical Impact and Occurrences**

A number of notable nor'easters have impacted North Carolina in recent decades, including the Ash Wednesday Storm of March 1962, but they were typically only of local concern to coastal municipalities. One exception to this was the nor'easter of late October and early November, 1990, which loosened a dredge barge that struck and destroyed approximately five roadway segments of the Bonner Bridge in Dare City. Greenville felt winds and rain from this storm, but nothing more.

"The Perfect Storm": Oct. 28 – Nov.1, 1991 – On October 28, 1991, a nor'easter of low pressure developed along a cold front a few hundred miles east of Nova Scotia. With strong upper air support, this nor'easter rapidly deepened and became the dominant weather feature in the Western Atlantic. Hurricane Grace, which was also heading northwest, took a turn eastward in response to the currents caused by the nor'easter. As low-pressure continued to deepen, Hurricane Grace and the low-pressure nor'easter collided to create a subtropical event of massive proportions. Much of the East Coast was severely damaged by high winds, high tides, and substantial beach erosion. On October 30th and 31st, this storm reached its maximum intensity, and is also known as the great "Halloween Storm." North Carolina's coast specifically was lashed with occasional winds of 35-45 miles per hour for five consecutive days, and waves from 10 to 30 feet in

height struck the coastline and pushed high tides three to seven feet above normal. Greenville also felt the affects of these winds, but there is no data of any significant damage in Greenville. Total damages in North Carolina, however came in at about $6.7 million dollars, and damaged 525 houses. *(Source: NCDC: Satellite Events Archive, http://www.ncdc.noaa.gov/oa/satellite)*

Areas closer to the cost suffered most recently on January 27, 1998, devastated by a nor'easter that originated off the southeast coast and combined with a strong high-pressure system over New England to produce gale force winds along the coast. Tides between 14 and 18 feet resulted in coastal flooding and lead to major beach erosion problems along the Outer Banks. In Nags Head alone, 18 houses were condemned and along the 11-mile stretch of shoreline an average of 45 feet of beach washed away. On Ocracoke Island, N.C., Route 12 was washed over and much of the dune structure on the northern end of the island was washed away. In the wake of the storm, some sound-side flooding was reported on Hatteras Island, and heavy rains of up to 5 inches caused lowland flooding and some secondary roads to become impassible. Total damages for the entire region during this event are estimated at 22 million dollars.

❖ *WILDFIRES*

♦ Description

A wildfire is an undesirable, uncontrolled burning of grasslands, brush or woodlands. According to the National Weather Service, more than 100,000 wildfires occur in the United States each year. Approximately 90% of wildfires start as a result of human actions (i.e., campfires, debris burning, smoking, etc.); lightning starts the other 10%.

The potential for wildfire depends upon surface fuel characteristics, weather conditions, recent climate conditions, topography, and fire behavior. Fuels are anything that fire can and will burn, and are the combustible materials that sustain a wildfire. Typically, this is the most prevalent vegetation in a given area. The intensity of fires and the rate with which they spread is directly rated to the wind speed, temperature and relative humidity. Climatic conditions such as long-term drought also play a major role in the number and intensity of wildfires, and topography is important because the slope and shape of the terrain can change the rate of speed at which fire travels. There are four major types of wildfires. **Ground fires** burn in natural litter, duff, roots or sometimes-high organic soils. Once started they are very difficult to control, and some ground fires may even rekindle after being extinguished. **Surface fires** burn in grasses and low shrubs (up to 4' tall) or in the lower branches of trees. They have the potential to spread rapidly, and the ease of their control depends upon the fuel involved. **Crown fires** burn in the tops of trees, and the ease of their control depends greatly upon wind conditions. **Spotting fires** occur when burning embers are thrown ahead of the main fire, and can be produced by crown fires as well as wind and topographic conditions. Once spotting begins, the fire will be very difficult to control. Wildfires become significant threats to life and property along what is known as the "wildland/urban interface." The wildland/urban interface is defined as the area where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels. Since

1985, approximately 9,000 homes have been lost to urban/wildland interface fires across the United States.

♦ **Likelihood of Occurrence**

In North Carolina, wildfire potential has been assessed using State Forest Service records for the period 1950-1993. As development has spread into areas which were previously rural, new residents have been relatively unaware of the hazards posed by wildfires, and have used highly flammable material for constructing buildings. This has not only increased the threat of loss of life and property, but has also resulted in a greater population of people less prepared to cope with wildfire hazards. The southern coastal plain is most vulnerable to wildfire hazards. Counties were classified as High (score of 3), Moderate (score of 2), or Low (score of 1) depending on their rank, for both number of fires and number of acres burned. The scores for both of these statistics were then added to generate a combined classification. The combined scores ranged from a low of 2 to a high of 5. Greenville and Pitt County's combined score was a 2, indicating a low probability of occurrence.

♦ **Historical Impact and Occurrences**

Between 1928 and 2000, the North Carolina Division of Forest Resources has recorded a total of 281,660 wildfires for an average number of 3,858 fires per year. For that same period, a total of 9,598,498 acres have burned for an average of 131,486 acres per year. According to the U.S. Forest service, a total of 4,949 fires burned 25,146 acres and destroyed 27 homes and 275 structures in North Carolina during the year 2000.

Whereas the City of Greenville is quite urbanized, the impact of wildfires has been quite low, despite the existence of wildfires farther out in Pitt County. Increased development over the years has increased the potential impact of wildfires as structures that locate near woodlands become vulnerable. According to data provided by the State Forestry Service, the frequency of wildfires in Pitt County is relatively moderate in the rural areas. Since 1994 there have been 117 wildfires resulting in 390 acres burned. None of this was in the City of Greenville directly.

❖ *EARTHQUAKES*

♦ **Description**

Earthquakes are geologic events that involve movement or shaking of the Earth's crust. Earthquakes are usually caused by the release of stresses accumulated as a result of the rupture of rocks along opposing fault planes in the Earth's outer crust. These fault planes generally follow the outlines of the continents.

Earthquakes are measured in terms of their magnitude and intensity. Magnitude is measured using the Richter Scale, an open-ended logarithmic scale that describes the energy release of an earthquake through a measure of shock wave amplitude. Each unit

increase in magnitude on the Richter Scale corresponds to a ten-fold increase in wave amplitude, or a 244-fold increase in energy. Intensity is most commonly measured using the Modified Mercalli Intensity (MMI) Scale. It is a twelve-level scale based on direct and indirect measurements of seismic effects.

- **Likelihood of Occurrence**

In North Carolina, earthquake epicenters are generally concentrated in the active Eastern Tennessee Seismic Zone. The Eastern Tennessee Seismic Zone is part of a crescent of moderate seismic activity risk extending from Charleston, South Carolina northwestward into eastern Tennessee and then curving northeastward into central Virginia. While there have not been any earthquakes with a MMI intensity greater than IV since 1928 in this area, it has the potential to produce an earthquake of significant intensity in the future.

North Carolina's susceptibility to earthquakes decreases from west to east in relation to the Eastern Tennessee Seismic Zone. Generally, there are three different zones of seismic risk in North Carolina. The eastern portion of the State faces minimal effects from seismic activity. Locations in the middle and southeastern areas of the State face a moderate hazard from seismic activity, while the area from Mecklenburg City west through the Blue Ridge faces the greatest risk from seismic activity. These different levels of risk correspond to proximity to areas with historical seismic activity and changes in topography.

The City of Greenville is located in the portion of North Carolina least susceptible to the effects of earthquakes.

- **Historical Impact and Occurrences**

Earthquakes are relatively infrequent but not uncommon in North Carolina. From 1568 to 1992, 157 earthquakes have occurred in North Carolina. The earliest North Carolina earthquake on record is that of March 8, 1735, near Bath. It is likely that this earthquake was less than intensity V (Slightly strong; sleepers awake). During the great earthquake of 1811 (intensity VI), centered in the Mississippi Valley near New Madrid, Missouri, tremors were felt throughout North Carolina. The most property damage in North Carolina ever attributed to an earthquake was caused by the August 31, 1886, Charleston, South Carolina shock. The quake left approximately 65 people dead in Charleston and caused chimney collapses, fallen plaster, and cracked walls in Abbottsburg, Charlotte, Elizabethtown, Henderson, Hillsborough, Raleigh, Waynesville, and Whiteville. On February 21, 1916, the Asheville area was the center for a large intensity VI earthquake, which was felt in Alabama, Georgia, Kentucky, South Carolina, Tennessee, and Virginia. Subsequent minor earthquakes have caused damage in North Carolina in 1926, 1928, 1957, 1959, 1971, 1973, and 1976. The nearest occurrence of an earthquake to Greenville and Pitt County surfaced in Craven County, with an approximate magnitude of 3.0 on the Richter Scale. There is no history of damage in the City of Greenville resulting from earthquakes that made the scale. However, in 1994, a small tremble did occur in Greenville.

Table 11:
Modified Mercalli Intensity Scale for Earthquakes

Scale	Intensity	Description of Effects	Richer Scale Mag.
I	Instrumental	Detected only on seismographs	
II	Feeble	Some people feel it	<4.2
III	Slight	Felt by people resting; like a truck	
IV	Moderate	Felt by people walking	
V	Slightly Strong	Sleepers awake; church bells ring	<4.8
VI	Strong	Trees sway; suspended objects swing, objects fall off shelves	<5.4
VII	Very Strong	Mild alarm; walls crack; plaster falls	<6.1
VIII	Destructive	Moving cars uncontrollable; masonry fractures, poorly constructed buildings damaged.	
IX	Ruinous	Some houses collapse; ground cracks; pipes break open	<6.9
X	Disastrous	Ground cracks profusely; many buildings destroyed; liquefaction and landslides widespread	<7.3
XI	Very Disastrous	Most buildings and bridges collapse; roads, railways and pipes destroyed; general triggering of other hazards	<8.1
XII	Catastrophic	Total destruction; trees fall; ground rises and falls in waves	>8.1

Source: North Carolina Division of Emergency Management

B. VULNERABILITY ANALYSIS

Natural hazards pose problems to humans when human activity gets in the way of the impacts that occur as a matter of course during and after a hazard. Vulnerability to a natural hazard can be defined as the extent to which people experience harm and property damage from a hazard. Hazards may result in loss of life or injury to people and livestock; loss or damage to homes, businesses, and industries; loss or damage to automobiles, furnishings, records and documents; damages or interruptions to power and telephone lines; damage or closing of roads, railroads,

airports, and waterways; and general disruption of life. It is important to know where and to what extent the community is susceptible to the impacts of natural hazards.

Vulnerability to natural hazards exists both at the present time and in the future. The present level of development and infrastructure generates a set of conditions that result in every area having some degree of vulnerability to natural hazards. That degree of vulnerability will change in the future as an area experiences an increase or decrease in development and whether the community implements or ignores hazard mitigation. Therefore, we can speak of both present vulnerability and future vulnerability. The previous section gave a description of each hazard, and identified its likelihood of occurrence and historical impacts. The City of Greenville is most vulnerable to riverine flooding and urban storm water flooding caused mostly by flash floods as they relate to other major hazard events, including severe thunderstorms, tropical storms and hurricanes.

The entire jurisdiction is relatively flat with elevations at or below 25-feet above sea level. Greenville's Flood Hazard areas, as identified by FEMA (100 and 500-year floodplains), are the primary locations for vulnerability to flooding being that the extents of most flood hazard events occur within these areas. Other hazards that are identified may affect Greenville's entire jurisdiction due to its geographic location in the Coastal Plains Region of North Carolina, and within climate division 7 as identified by the National Climatic Data Center.

The City of Greenville has a high vulnerability to tornadoes, mostly as they are caused by other tropical storm events, although they usually don't cause much damage, or only cause damage at an F0 or F1 magnitude on the Fujita-Simpson Scale.

An area's vulnerability will change with time. For instance, if the current development patterns are projected into the future, it is possible to develop estimates of the population and the amount of development that will exist in an area at some future point. Future vulnerability will also be analyzed with this plan, and mitigation strategies assessed based on some key planning practices of the City of Greenville.

C. IMPACT ANALYSIS & LIKELIHOOD OF OCCURRENCE

Certain natural hazards are considered more of a threat than others within the City of Greenville, which will be the focus of this analysis. The combination between a hazards impact and its likelihood of occurrence determine Greenville's overall risk conclusion to the 8 natural disasters described by this plan. Hazard impacts are broken down as follows:

- **Critical Impact** – 25 to 50% damage associated with the disaster, which either occurs within a certain geographic area or has a widespread effect (ex. – within the 100-year floodplain, a 50 to 100-year flooding event has a critical impact; a category 2 hurricane or greater has a critical impact within the floodplain due to its rain, but also widespread due to associated winds and possible tornadoes), and may cause severe injuries. More than 25% of property could be severely damaged by a critical storm.

- **Limited Impact** – 10 to 25% damage associated with the disaster, which either occurs within a certain geographic area or has a widespread effect (ex. – an F1 moderate tornado would have a limited impact because it may not cover a lot of ground, but a nor'easter would

have a limited impact over a larger geographic area), and may cause some minor injuries. More than 10% of property could be severely damaged

- **Minor Impact** – Less than 10% damage associated with the disaster. Minimal quality of life impact, and less than 10% of properties are severely damaged.

Some hazards are more likely to occur than others, but may have limited impacts. The likelihood of hazard occurrence is hypothetical, however due to Greenville's history of severe weather, it is important to address what is predicted to occur. Hazard likelihood is broken down as follows:

- **Highly Likely** – There is near 100% probability that the hazard will occur in the next year.
- **Likely** – Between 10 and 100% probability that the hazard will occur in the next year, or at least one chance in the next 10 years
- **Possible** – Between 1 and 10% probability in the next year, or at least one chance in the next 100 years
- **Unlikely** – Less than a 1% probability in the next year, or less than one chance in the next 100 years

Table 12 describes Greenville's vulnerability by hazard in order to provide a profile of each hazard relative to the others.

Table 12:
Hazard Risk Index

Hazard	Magnitude	Likelihood of Occurrence	Impact	Risk Conclusion
Flooding*	10-49 year event 50-100 year event	Likely Possible	Limited Critical	High Risk
Hurricanes*	Tropical Storm Category 1 Category 2	Likely Likely Possible	Limited Limited Critical	High Risk
Tornadoes*	F0 (Gale) F1 (Moderate)	Highly Likely Likely	Minor Limited	Moderate Risk
Thunderstorms	Severe	Highly Likely	Minor	Moderate Risk
Nor'Easters	Categories 1&2	Likely	Limited	Moderate Risk
Winter Storms	Severe	Possible	Limited	Low Risk
Wildfires	Moderate	Unlikely	Minor	Low Risk
Earthquakes	Moderate	Unlikely	Minor	Very Low Risk

* *indicates a hazard in which a critical event has occurred in Greenville that caused significant damages and injuries or possible deaths*

Source: "Keeping Natural Hazards from becoming Disasters" published by NCDEM

Each hazard has been identified as having a potential risk within the City of Greenville based on this table. The magnitude gives specific classifications of hazards based on their scales. Since flooding, hurricanes, and tornadoes have the greatest risk in Greenville and Pitt County, the risk was assessed based on more than one type of storm in terms of magnitude. These three storms are also the main focus of the plan. For example, a tropical storm has a higher risk than a category 1 or 2 hurricane, but has a limited impact.

END OF SECTION

VULNERABILITY ASSESSMENT

A. LAND USE VULNERABILITY

A series of tables and maps are used to describe vulnerability within two locations based on occurrence patterns. The first is to describe vulnerability within the floodplain areas as identified by FEMA. Due to the fact that Greenville has recently experienced a significant flood that swelled as far as the 500-year flood limits, the floodway, 100-year and 500-year floodplains are all included in this analysis. The other set of maps describe vulnerability within Greenville's jurisdiction limits, which includes both the City limits, and the extraterritorial jurisdiction (ETJ).

Tables 13 and 14 describe Greenville's land use composition within the entire jurisdiction and within the floodplain, and include the acreage, current tax value and building value. This data is approximately 85% accurate for 2003. Land use is broken down as follows:

- Single Family – Includes all single family attached and detached housing, and mobile homes located on their own lot.
- Multi-Family – Includes townhouse communities, duplexes, condominiums, apartments and mobile home parks.
- Institutional – Includes schools, churches, libraries, retirement homes, day care centers, and medical uses including the hospital.
- Commercial – All types of commercial including neighborhood businesses, shopping centers and hotels.
- Industrial – Includes light and heavy industries, industrial parks, and also includes the airport and landfills
- Recreation – Includes all public and private recreation areas, cemeteries, and designated open space or "common areas."
- Office – Includes professional, governmental, and medical offices.
- Utility – Includes electric substations, water tanks, and utility headquarters.
- Vacant – Includes all sites that are vacant or have vacated buildings, but also includes agricultural areas with a building that has value taking up less that 20% of the site, and public parking lots and public spaces not designated as recreational.

Table 13:
Greenville Land Use and Property Vulnerability by Total Jurisdiction

Land Use	# of Properties	Acres	%	Tax Value (millions)	Bldg. Value (millions)
Single Family	13,599	5,928	15.8	$1,750	$1,420
Multi-Family	6,958	2,473	6.6	$930	$754
Institutional	432	1,708	4.6	$794	$632

Commercial	1,340	1,802	4.8	$571	$309
Industrial	103	2,127	5.7	$1.72	$1.37
Recreational	169	1,704	4.5	$67	$21.5
Office	748	580	1.5	$300	$205
Utility	58	500	1.3	$21.5	$5.5
Vacant	4,172	20,692	55.2	$710	$397
Total	**27,579**	**37,514**	**100**	**$5,145**	**$3,745**

Table 14:
Greenville Land Use and Property Vulnerability by Floodplain

Land Use	# of Properties	Acres	%	Tax Value (millions)	Bldg. Value (millions)
Single Family	1,413	694	6.5	$89.3	$68.9
Multi-Family	369	457	4.2	$104.9	$86.4
Institutional	67	373	3.5	$60.0	$50.3
Commercial	165	360	3.3	$28.5	$17.5
Industrial	28	1,177	10.9	$44.8	$28.5
Recreational	97	948	8.8	$24.6	$7.1
Office	25	64	0.6	$10.8	$6.8
Utility	27	404	3.7	$15.8	$5.0
Vacant	1,005	6,321	58.5	$93.6	$46.8
Total	**3,196**	**10,798**	**100**	**$472**	**$317**

Map 8 and Map 9 illustrate this data.

B. BUILDING & INFRASTRUCTURE VULNERABILITY

17,301 buildings were calculated for the City of Greenville's jurisdiction in 2003. Based on building permit data for the past decade, it is estimated that over 20,000 buildings will be constructed by the end of 2005. According to Table 12 above, the building value within Greenville's jurisdiction as of 2003 is around 3.7 billion dollars, which is vulnerable to all types of natural hazards, specifically those that occur in sporadic patterns, or have the potential of covering the entire City.

1,475 buildings are currently located within the floodplain with a value of around 317 million dollars per Table 13's value. Based on 1998 data (prior to Hurricane Floyd), there were 3,075 buildings located within the floodplain. The City of Greenville has created policies that will phase out development within the floodplain. These policies will be mentioned as mitigation strategies. During the HMGP buyout process, the City purchased 268 properties, and placed deed restrictions on these properties to ensure that future development could not occur. Other properties were purchased using CDBG and State Repair and Replacement funds, or other sources of funding. Although there are instances where building permits will be necessary within the floodplain to

ensure that citizens of Greenville can still use their properties, this area will not experience growth and the vulnerability to flooding events has been greatly decreased. This is mainly due to the City's commitment to make changes to local ordinances and policies after Hurricane Floyd left its mark within the City of Greenville, significantly affecting it's citizens way of life.

The City has four (4) structures that have more than one claim against the National Flood Insurance Program (NFIP). These structures are known as "repetitive loss structures" and represent properties that are in high-risk flood areas exacerbated by localized drainage concerns. These structures are delineated in Table 15:

Table 15:
NFIP Repetitive Loss Structures in the City of Greenville

Owner Name	Address	Parcel ID #
Melford Ebron	3203 Ellsworth Drive	28855
George Hamilton	210 Lakewood Drive	9576
Mark W. Owens	1106 E. Tenth Street	10726
Daniel & Crystal Eckert	Route 11, Box 138	18953

It is very important to discuss Greenville's vulnerability of infrastructure such as bridges, roads, railroads, and airports within Greenville's jurisdiction and floodplain boundaries. Within Greenville's jurisdiction, the Planning and Zoning Commission approve new subdivisions every month at a fast rate. Most of these are void of street planning within the floodplain, however the increase of suburban sprawl causes more people to drive on busy streets in the instance of an emergency. According to 2003 data collected, there were 442.18 miles of street segments within the City's jurisdiction and 73.55 within the floodplain (17% of total streets). Additional infrastructure includes bridges, the Seaboard Coastline Railroad, which crosses through Greenville's jurisdiction, and the Pitt-Greenville Airport, which lies entirely within the floodplain and was severely flooded after Hurricane Floyd.

Other infrastructure that may be affected is the location of water, sewer, gas and electric lines. At the present time, the City of Greenville contracts their utility service with Greenville Utilities Commission (GUC) and does not have access to GIS data related to these utility lines. The ability for GUC to acquire this data and provide it to the City will be a mitigation strategy to document future vulnerability.

Map 10 illustrates building and infrastructure vulnerability.

C. CRITICAL FACILITIES

Critical facilities include those facilities that are necessary in the daily operation of a community. Certain critical facilities are vital to the response and recovery efforts in the wake of a disaster resulting from a natural or technological hazard. The following is a listing of the types of critical facilities identified by this plan:

- Community Facilities – Includes public buildings such as shelters, recreation facilities, libraries, convention centers, and government centers. These buildings should be operational at least 72 hours following an event, and can be used as public gathering places and shelters.
- Fire Stations – Includes all City and Volunteer Fire Stations. Fire Stations are crucial for emergencies and must be operational within 24 hours following an event.
- Hospital – The Pitt County Memorial Hospital is critical, and should be operational immediately following an event.
- Operations/Infrastructure Facilities – Includes electric substations, water towers, water and sewer treatment plants and utility operations facilities. It is extremely important that the operations of the City of Greenville are secured following an event.
- Schools – Includes all the Pitt County Schools located within the City of Greenville. Like community facilities, it is important that schools are available to be used as shelters or gathering spaces after an event, and should be operational within 72 hours.
- University Facilities – Due to the fact that about one-third of Greenville's population is comprised of students, it is important to list similar facilities that the university could and should provide following a disaster event. These can include auditoriums, libraries, recreation centers, and dining halls.

Table 16 provides a comprehensive listing of the facilities that have been identified as being critical for the City of Greenville, and includes the associated costs of the building and the land in terms of vulnerable value. University facilities may have higher land values due to the fact that multiple buildings are found on the same parcel. Map 11 illustrates this data.

Table 16:
Critical Facilities of the City of Greenville (current)

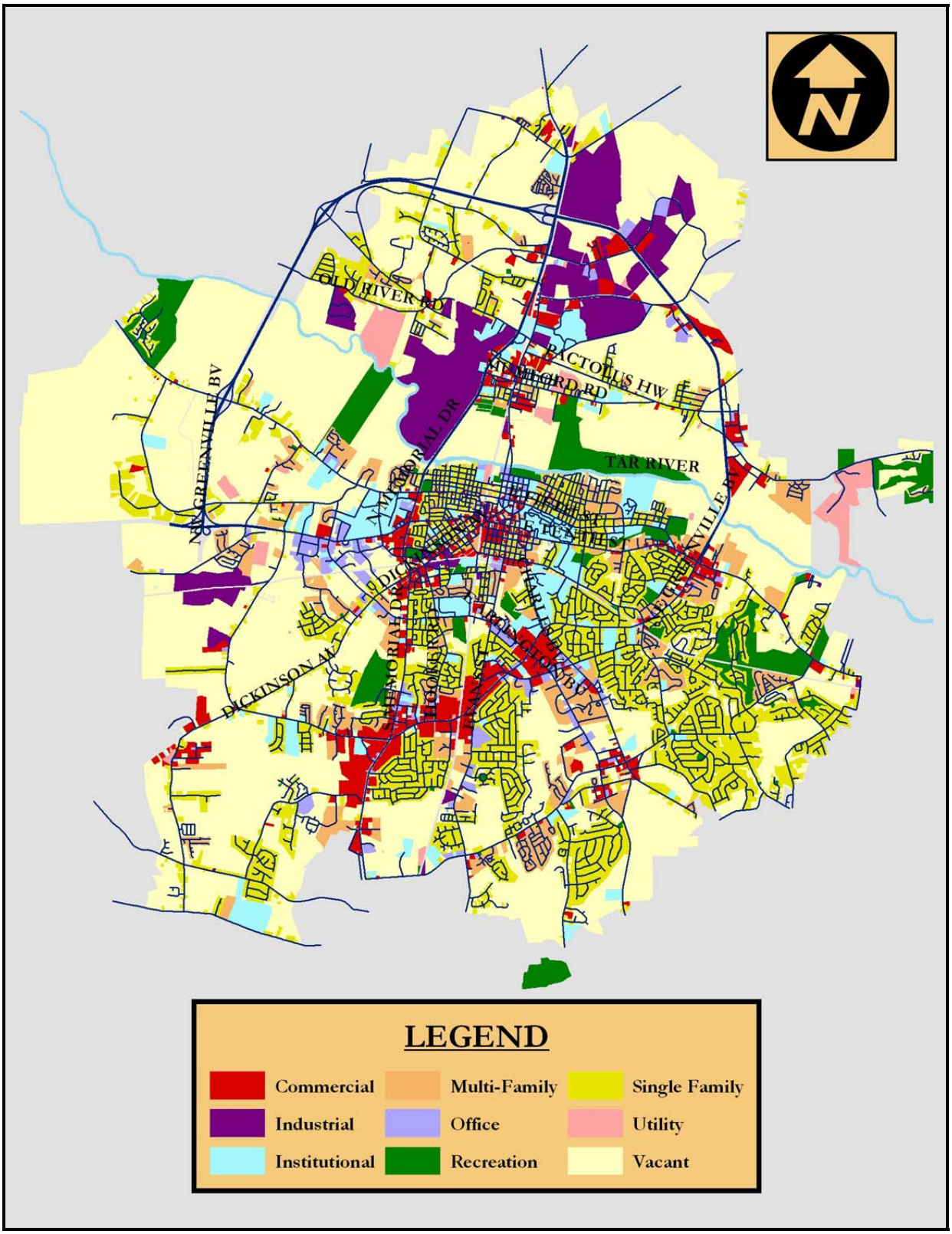
TYPE	NAME	FLDPLAIN	Bldg. Value	Land Value
Community Facilities	Jaycee Park / East Branch Library		$1.19 M	$366.4 K
Community Facilities	Elm Street Park and Gymnasium	*	$619 K	$490.2 K
Community Facilities	River Park North Science & Nature Center	*	$ 733 K	$243.1 K
Community Facilities	Aquatics & Fitness Center	*	$7.01 M	$238.5 K
Community Facilities	Boyd Lee Park & Complex	*	$1.1 M	$751.7 K
Community Facilities	Guy Smith Stadium		$0.0 K	$502 K
Community Facilities	Eppes Gym / Thomas Foreman Park		$940 K	$146 K
Community Facilities	Teen Center		$253 K	$75.8 K
Community Facilities	River Birch Tennis Center		$286 K	$733.8 K
Community Facilities	Greenville City Hall		$1.01 M	$168.1 K
Community Facilities	Sheppard Memorial Library		$2.41 M	$504.5 K
Community Facilities	Greenville Convention Center		$3.63 M	$2.13 M
Community Facilities	Community Shelter		$418 K	$126 K
Fire Station	Peppermint Park Fire Station		$104 K	$37.5 K
Fire Station	Greenville FR3		$459 K	$353.7 K
Fire Station	Greenville FR1		$2.3 M	$682 K

Fire Station	Greenville FR2		$523 K	$80.5 K
Fire Station	Staton House F14		$275 K	$152.2 K
Fire Station	Greenville FR4	*	$0.0 K	$5.5 K
Fire Station	Red Oak F51		$87 K	$35 K
Fire Station	Greenville Fire		$524.6 K	$92 K
Hospital	Pitt County Memorial Hospital		$132.5 M	$5.18 M
Oper./Infra. Facilities	Water Treatment Plant	*	$7.3 K	$223.8 M
Oper./Infra. Facilities	Wastewater Treatment Plant	*	$0.00	$227.7 M
Oper./Infra. Facilities	Water Treatment Plant	*	$0.00	$199.9 K
Oper./Infra. Facilities	Greenville Water Supply		$0.00	$21 K
Oper./Infra. Facilities	Water Tank & Electric Substation		$0.00	$217.7 K
Oper./Infra. Facilities	Electric Substation	*	$0.00	$13.6 K
Oper./Infra. Facilities	GUC Operations Center	*	$3.37 M	$278.3 K
Oper./Infra. Facilities	Brody School of Medicine Plant (ECU)		$1.94 M	$4.17 M
Oper./Infra. Facilities	14th Street Steam Plant (ECU)		$1.96 M	$1.11 M
Schools	Third Street		$225.2 K	$214.5 K
Schools	Wellcome Middle		$4.39 M	$392.9 K
Schools	Sadie Saulter Elementary		$2.27 M	$142.5 K
Schools	South Greenville Elementary		$3.09 M	$258 K
Schools	J.H. Rose High School		$13.14 M	$905 K
Schools	Elmhurst Elementary		$1.9 M	$1.24 M
Schools	C.M. Epps Middle		$5.96 M	$884 K
Schools	Wahl-Coates Elementary		$3.4 M	$902 K
Schools	Eastern Elementary		$3.17 M	$375 K
Schools	E.B. Aycock Middle		$7.45 M	$682.5 K
Schools	Wintergreen Primary/Intermediate		$5.99 M	$415 K
Schools	South Central High School		$20.6 M	$1.19 M
University Facilities	ECU Student Recreation Center		$27.8 M	$2.37 M
University Facilities	Todd Dining Hall		$6.14 M	$2.19 M
University Facilities	Joyner Library		$42.9 M	N/A
University Facilities	East Carolina Athletic Complex (Minges)		$25.5 M	$2.38 M
University Facilities	Cotanche Bldg - IT & Computing Services		$5.5 M	$276 K
University Facilities	Blount House		$518.4 K	$105 K
University Facilities	Student Health Services		$1.92 M	$3.67 M

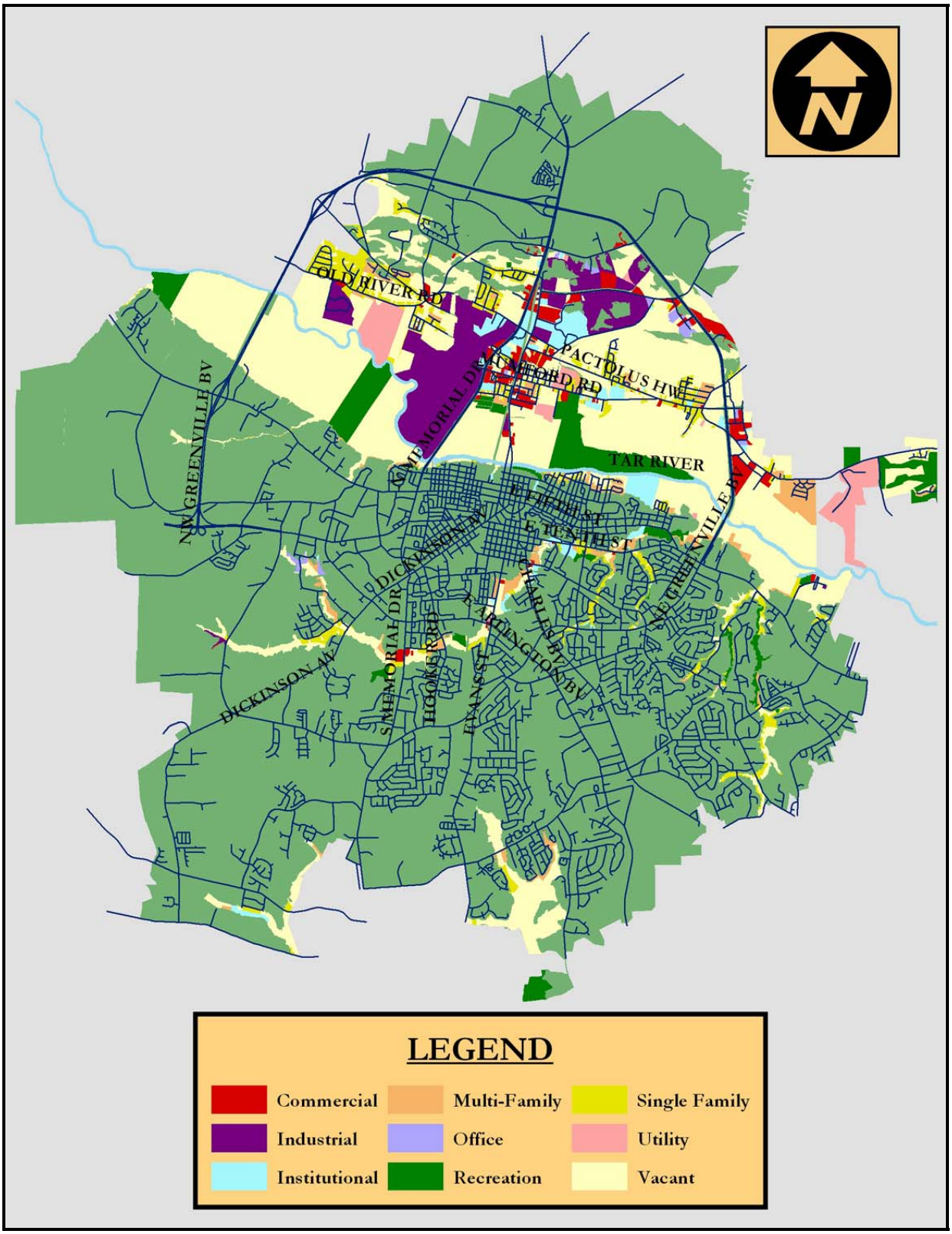
Total value of all critical facilities equals approximately **$345.06 million dollars** in building value and **$489.18 million dollars** in land value. Within the floodplain, building value equals approximately **$12.84 million dollars**, and land value approximately **$225.82 million dollars**.

MAPS 8-11 CONTINUE ON THE FOLLOWING 4 PAGES

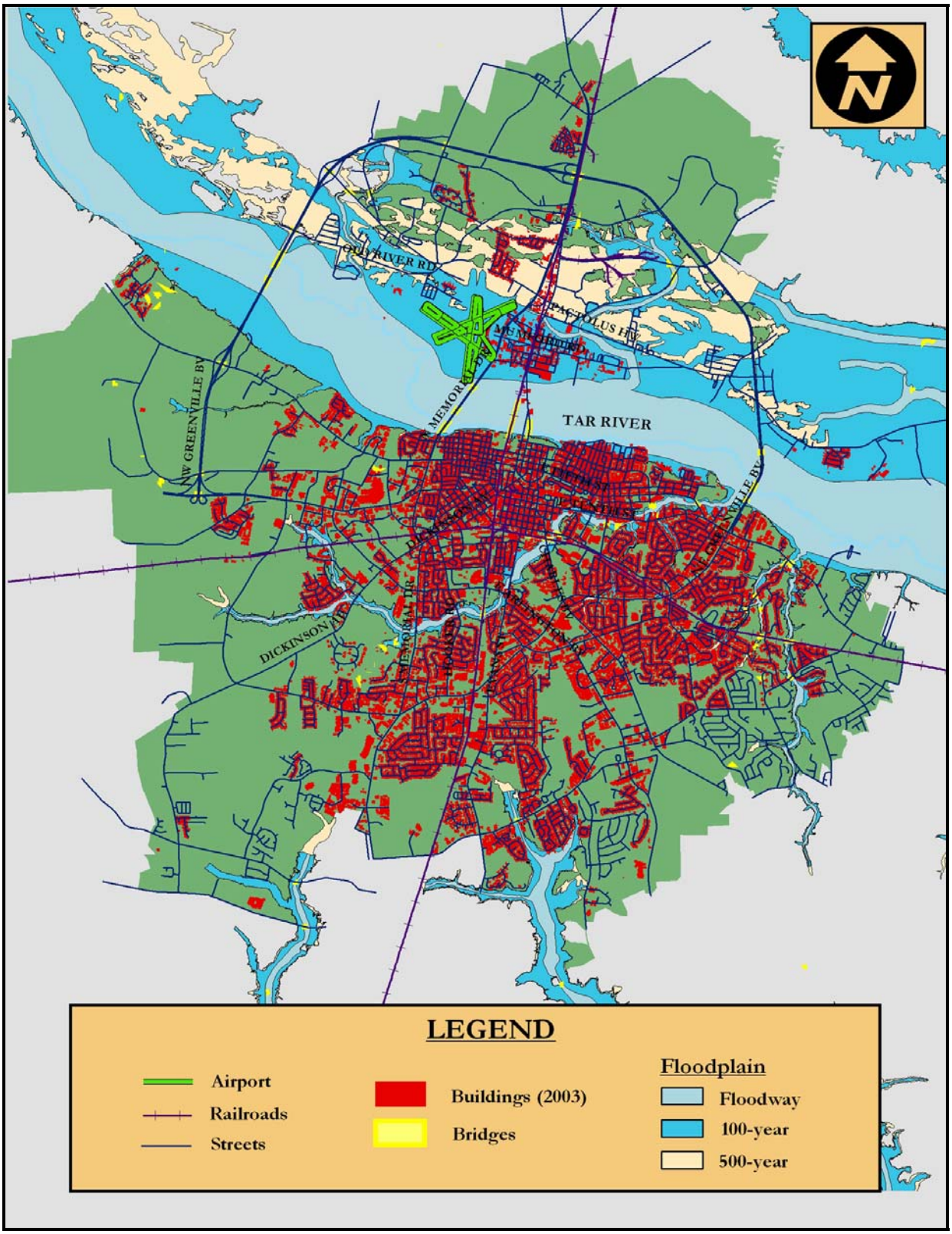
Map 8:
Land Use Vulnerability – Entire Jurisdiction



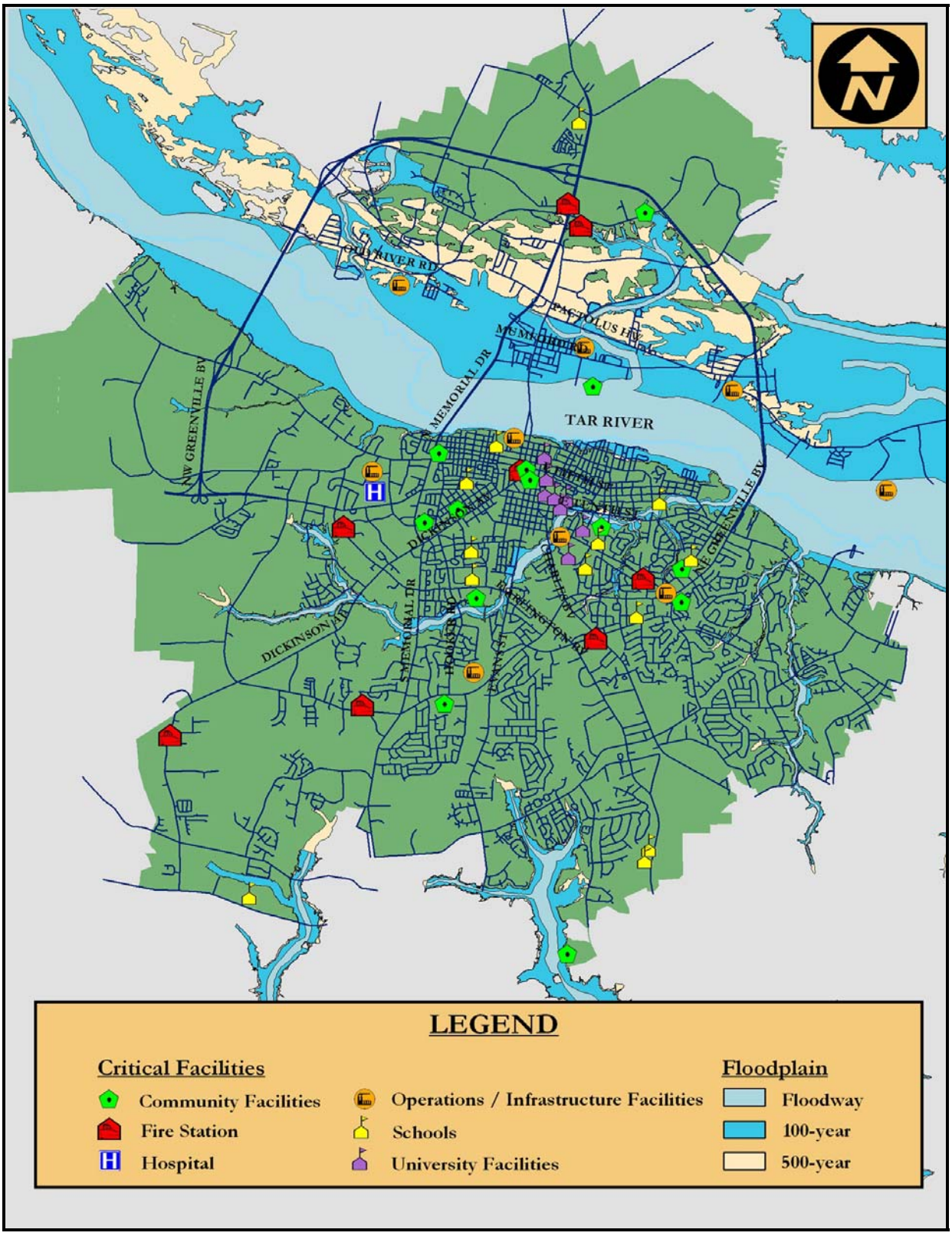
Map 9:
Land Use Vulnerability – Floodplain



Map 10:
Building & Infrastructure Vulnerability



Map 11:
Critical Facilities



D. FUTURE VULNERABILITY

Future vulnerability is described as the extent to which people are expected to experience harm and property damage by a hazard event if projected development were to occur. Greenville's future vulnerability will be determined by the land use pattern, and how Greenville continues to grow. It is crucial that this kind of planning encourages the citizen's of Greenville to make smart land use decisions that will not increase Greenville's vulnerability to natural hazards. For instance, it is crucial to discourage a significant density of development within the floodplain. The City of Greenville is one of the fastest growing municipalities in the State of North Carolina. As mentioned in the background section of this plan, the City consumes about 45% of the County's total land area. Since 2000, reports from the Planning Department and Building Inspections indicate the following facts about Greenville:

- According to 2000 Census data, the City of Greenville contained 28,145 total dwelling units, and 60,476 total residents.

- From 2000 through August of 2004, a total of 2,635 residential lots have been approved for construction through the subdivision process, and a total of 1,896 multi-family dwelling units were approved.

- Total dwelling units approved in Greenville increased by just over 16% from 2000 to August of 2004. By applying the 1998 Census average household size of 2.68 persons/dwelling unit, it is projected that 12,143 new residents could be in harms way of a natural disaster that could affect the City of Greenville as a whole, bringing the total estimated population to 72,619 people within the next two years.

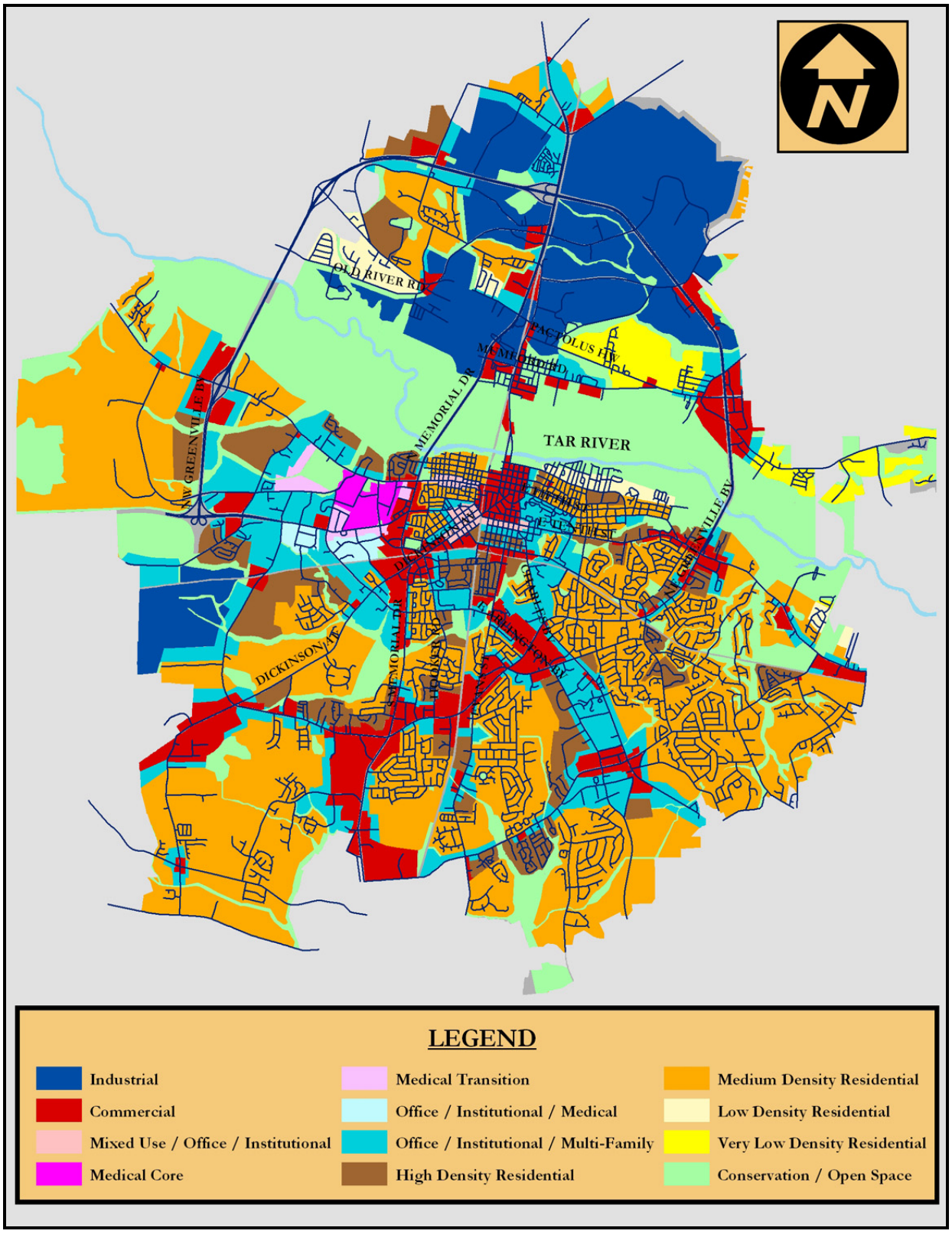
- 1998 Building Data shows that 3,075 buildings were located within the floodplain, and 2003 shows that number decreased to 1,475.

- Building permit data from January 2000 to June 2004 yields 104 new single-family homes, 170 mobile homes, 87 duplex and townhouse units, and a total of 102 multi-family units were developed in the floodplain. Using the same household calculation, it can be assumed that about 1,240 people have been added to the risk of being affected by a serious flood since 2000 even though twice as many have been removed from the floodplain after Hurricane Floyd.

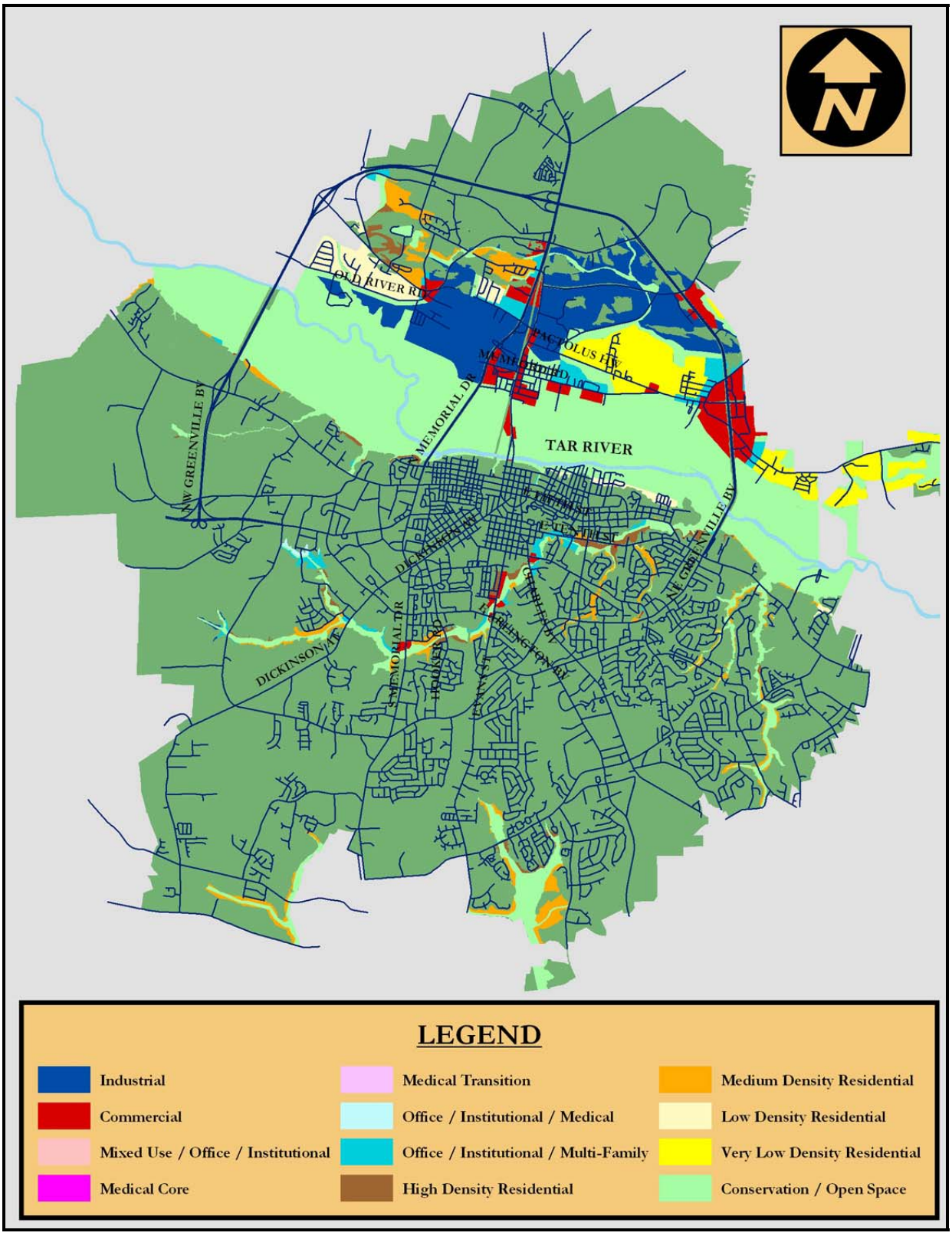
The City of Greenville's Comprehensive Plan, Horizons, describes the growth of Greenville and categorizes future land uses. Near the Tar River and its tributaries, future land use planning and zoning will play a key part in the future vulnerability to flooding. Most of these areas in the floodplain are planned for conservation/open space use, so future vulnerability would not increase at a rate comparative to the rest of the City. Maps 12 and 13 portray the City's Land Use Plan both within the entire jurisdiction and within the floodplain.

Planning of new roads and infrastructure will also be vulnerability to many disaster events in the future. Map 14 on page 54 shows proposed or potential street patterns based on the Thoroughfare Plan, and platted subdivision streets through 2004.

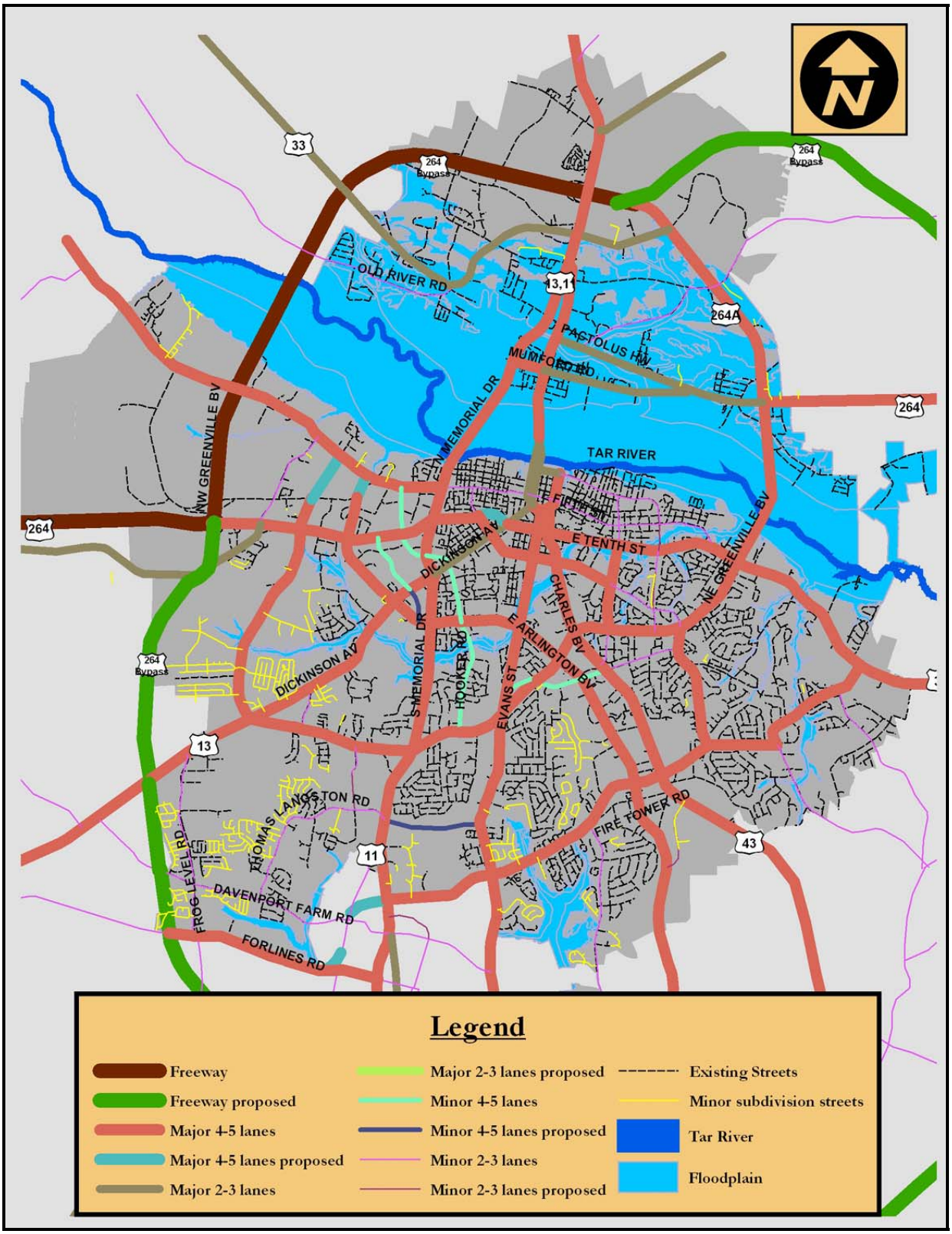
Map 12:
Horizons: Greenville's Community Plan Map



Map 13:
Horizons: Greenville's Community Plan Map (Floodplain)



Map 14:
Proposed Thoroughfares & Subdivision Streets Map



In terms of population growth, the City of Greenville's growth cannot be described based on a specific growth rate, therefore the Planning Department uses the flat-line method to determine future vulnerability of people. The following table describes Greenville's projected growth from 2000 to 2029.

Table 17:
Greenville Population Analysis (Part II)

Year	Population	% change per year	Average annual% change per decade	Year	Population	% change per year	Average annual% change per decade	Year	Population	% change per year	Average annual% change per decade
2000	61,209	5.215		**2010**	80,404	2.866		**2020**	106,657	2.866	
2001	60,966	-0.4		**2011**	82,708	2.866		**2021**	109,713	2.866	
2002	63,444	4.065		**2012**	85,078	2.866		**2022**	112,857	2.866	
2003	65,799	3.712		**2013**	87,516	2.866		**2023**	116,091	2.866	
2004	67,685	2.866		**2014**	90,024	2.866		**2024**	119,418	2.866	
2005	69,810	2.866	2.866	**2015**	92,604	2.866	2.866	**2025**	122,841	2.866	2.866
2006	71,811	2.866		**2016**	95,258	2.866		**2026**	126,362	2.866	
2007	73,869	2.866		**2017**	97,988	2.866		**2027**	129,984	2.866	
2008	75,986	2.866		**2018**	100,796	2.866		**2028**	133,709	2.866	
2009	78,164	2.866		**2019**	103,685	2.866		**2029**	137,541	2.866	

Data Source: North Carolina Office of State Budget and Management; North Carolina State Data Center

Years 1980 through 2003 are Estimates, certified by NC Office of State Budget and Management

Years 2004 and beyond are Projections, based on flat-line population growth of 2.866% per year
(2.866% represents the average annual % change in population over a 20-year period from 1984-2003)

Method used to calculate projected population:
(Population in Year X) = (Population in Year X - 1) x (1.02866)

E. FUTURE VULNERABILITY: CRITICAL FACILITIES

Over the course of the next 20 years, the City of Greenville will plan for several new projects that can be considered as critical facilities. Some facilities are unknown at this time, or may be known, but the location and value has not yet been identified. The Hazard Mitigation Plan shall be updated in two years to cover the cost and location specifics of more of these projects.

- **Fire Stations** – There are at least two new fire stations proposed in two new locations. One would be on 10th Street near the Brook Valley intersection, and the other somewhere within the Thomas Langston Road area.

- **City Hall Expansion / Municipal Service Relocation** – The current City Hall for the City of Greenville Government offices will be expanded to accommodate new staff, plus much of the administrative staff will be relocating in the building across the street formerly used by Greenville Utilities Commission, which will also be renovated and expanded. The expansion of the former GUC building is estimated to cost about $4.5 million dollars, and the renovations to City Hall will cost about $1.7 million dollars.

- **New Schools / Expansion to existing schools** – In 2000, South Central High School was the newest addition to the Pitt County School System and will continue to grow for the next few years. A middle school is also being planned beside the new high school. Additionally, a major expansion to the Sadie Salter School located in West Greenville is planned.

- **New Recreation Facilities** – As the City continues to grow, planning for new recreation facilities is extremely important. These facilities can also be used as critical facilities in the instance of a natural disaster. The basic area where these facilities will most likely be planned is in the south, where growth occurs at the most rapid pace. According to the City's Recreation and Parks Master Plan, the City is more in need of community and neighborhood-scale parks rather than larger regional or district parks. In terms of community parks, facilities are usually included, such as gymnasiums. The plan calls to locate a community park on Highway 33 near the Portertown Road area, and another somewhere within the Thomas Langston Road area. This pattern of expansion is similar to the location of new fire stations.

- **New University Facilities** – There are two main ECU expansion projects that will be considered critical facilities once they are operational. The first is the West End Dining Hall located on Reade Circle. This project is currently under construction. The fund amount budgeted for this project by the university was about $13.7 million dollars. The second key development is the North Recreation Fields Complex. This project is located north of the Tar River. Costs of this project have not been determined yet because it is still in its planning phase. Most likely, this complex will have some parts of it located within a 100 or 500-year floodplain.

A map of these facilities is not provided with this plan, but will be provided in an updated plan sometime over the next two years as soon as the information is available. In addition, there will be tables featuring associated costs more specifically.

END OF SECTION

MITIGATION STRATEGY

A. SUMMARY

Hazard mitigation reduces the loss of life and property from natural disasters and serves as an essential component in emergency management. After natural disasters, repairs and reconstruction are often completed in such a way as to simply restore damaged property to pre-disaster conditions. Replication of pre-disaster conditions results in a repetitive loss cycle of damage, reconstruction, and repeated damage. Hazard mitigation is needed to ensure that such cycles are broken, that post-disaster repairs and reconstruction take place after damages are analyzed, and that sounder, less vulnerable conditions are produced. The hazard mitigation plan required under Section 409 of Stafford Disaster Relief and Emergency Assistance Act (PL 93-288, as amended), is typically developed in a post-disaster situation; however, the plan developed after a disaster is essentially a pre-disaster plan for the next disaster. Hazard mitigation is the only phase of emergency management that can break the cycle of damage, reconstruction, and repeated damage.

In addition to the Stafford Act, there have been two Executive Orders dealing with flood losses. Executive Order 11988 is used by Federal Emergency Management Agency (FEMA) to deny disaster assistance in a repetitively flooded area. Instead, technical and financial resources of existing programs are used to help residents with relocation expenses and to prevent reoccupation of residential properties. The effect of this order is to mitigate future flood damages by encouraging residents to relocate.

Federal and state hazard mitigation officers limit federal and state investments in floodplains through Executive Order 11990. This order restricts the availability of Federal Housing Administration (FHA), and Veterans Housing Administration (VHA) low-interest loans to homebuyers, the availability of Small Business Administration loans for future development, and Department of Housing and Urban Development Community Development Block Grant funds. The effect is to reduce the financial incentive that encourages development in an identified flood hazard area.

Development of a hazard mitigation plan has the potential to not only restrict future development within flood hazard areas but also to ensure mitigation opportunities are not lost in the hasty effort to rebuild and recover from the next disaster. The intent of the hazard mitigation plan is to develop, over time, a disaster resistant community.

B. MITIGATION GOALS & OBJECTIVES

Goals are statements of desirable future conditions that are to be achieved. They are broad in scope and assist in setting community priorities. Objectives are more tangible and specific than goals. The following goals will provide the basis for the objectives, and corresponding implementation

strategies will be included in this plan, some of which are already being administered and implemented:

- Decrease the community's vulnerability to future hazard events
  - Continue to update the City's Emergency Management Plan, and provide more strategies for City operations following a disaster. Consider combining the Emergency Management Plan with the Hazard Mitigation plan, to make it tie in with mitigation strategies
  - Preserve open space in floodplain and environmentally sensitive areas
  - Improve education and outreach to the community regarding flood hazards and flood mitigation
  - Improve education, awareness and outreach to the community regarding other hazards that would affect the entire jurisdiction
  - Implement stronger development standards in the Flood Damage Prevention Ordinance
  - Ensure that the City has enough staff to administer and enforce current ordinances and policies to protect the City and to decrease its vulnerability
  - Consider adding all types of hazards, including recovery and reconstruction from man-made disasters such as chemical spills, or terrorism
  - Consider hiring an environmental planner for the City

- Reduce loss of life and personal injury from natural hazards
  - Ensure that critical facilities are operational immediately after the occurrence of a hazard
  - Ensure that emergency response is operational in accordance with a Level III emergency

- Minimize the damage to public infrastructure resulting from natural hazards
  - Make sure that emergency evacuation routes are identified
  - Avoid creating subdivisions with too many streets that would be susceptible to impact of a natural disaster
  - Develop a plan for relocating public infrastructure out of flood hazard areas
  - Continue to support subdivision design that promotes connectivity to existing collector streets and major thoroughfares
  - Continue to support existing stormwater control ordinances established by the City and State. Ensure that development complies with all stormwater regulations

- Maintain data in computer based format, upgrade the City's GIS system, and upgrade and maintain information about hazards in the library collection
  - Access and maintain a better GIS system with utility data from the Greenville Utilities Commission
  - Maintain floodplain elevation certificates in computer format, and link them to the GIS system
  - Enhance the City's website to include information about Hazard Mitigation and the programs and policies it relates to
  - Maintain computer-based records in database format of all structures acquired or elevated through city-sponsored projects

- Enhance the City's current flood hazard library collection to include this plan as well as information on all types of natural disasters it references

➢ Minimize loss of personal and real property from natural hazards, and ensure the continued success of emergency operation procedures

- Continue to update the City's Emergency Management Plan, and provide more strategies for City operations following a disaster. Consider combining the Emergency Management Plan with the Hazard Mitigation plan, to make it tie in with mitigation strategies
- Ensure that previously flooded or damaged properties are maintained as open space
- Establish a list of priorities for acquisition of private properties in the event of a future disaster
- Continue to support subdivision clustering to maximize density while preserving flood hazard areas
- Continue to support Watershed Protection Ordinances, and consider establishing more watershed protection areas
- Consider increasing perennial stream buffer requirements and requiring buffers along all intermittent streams as well as perennial streams

➢ Manage future development so that vulnerability to natural hazards is not significantly increased

- Consider study of an urban growth boundary to control Greenville's sprawl
- Delineate preferred growth areas away from the 100-year floodplain
- Support infill development in established areas that have a lower risk of being significantly damaged from a flood or other hazard event
- Promote greenways, parks and recreation uses throughout the City, particularly along existing streams and in previously flooded areas utilizing flood buyout properties
- Recommend rezoning requests to consider using the Conservation Overlay Zoning District to ensure that vulnerable areas will never be developed

➢ Expedite post disaster reconstruction

- Develop a comprehensive post disaster recovery and reconstruction plan for the City
- Participate in the directives of the Pitt County Emergency Operations Plan (EOP)
- Continue to establish a flood recovery center when needed to address post disaster issues. Utilize existing staff and create temporary positions for the FRC. Utilize the environmental planner to direct the division
- Continue to seek funding from state sources such as the Hazard Mitigation Grant Program and the Housing Crisis Assistance Funds for housing and tenant relocation projects
- Ensure that critical facilities are located within reasonable locations. Consider developing new facilities where needed

➢ Protect the fragile natural and scenic areas located along the Tar River and its tributaries

- Consider establishing a tree preservation and protection ordinance that will address clear cutting and tree removal on private properties
- Ensure that stream buffers are undisturbed by development unless stormwater improvements are necessary, or walking trails based on the proposed greenway system can be established
- Ensure that the appropriate greenway trail types are used in areas where preservation of natural materials is encouraged

The goals and objectives identified above were developed during working meetings of the Flood Recovery Task Force and through consultations with the city's staff. The Hazard Mitigation Plan Team revisited these goals and objectives and expounded on them based on new requirements.

Mitigation goals can only be accomplished within the planning context of providing a sustainable environment that meets the needs of today while protecting the needs of future generations. Sustainable development and smart growth principles of land stewardship, protection of the natural environment, and preservation of natural resources have all been considered during the development of mitigation activities. The real challenge, however, has not and will not be the development of mitigation activities, but will come in the months and years ahead as the people and leaders of the City of Greenville convert the Hazard Mitigation Plan into action.

The remainder of this section will include the objectives and implementation strategies necessary to obtain the city's hazard mitigation goals and recommendations for plan monitoring, evaluation, and updating.

C. EXISTING MITIGATION STRATEGIES

The following provides a summary of projects, plans, and ordinances relevant to hazard mitigation that the city currently implements. The continued implementation of existing strategies is appropriate to meet the majority of the goals and objectives of this plan.

❖ Flood Damage and Prevention Ordinance

The City of Greenville participates in the National Flood Insurance Program (NFIP) and complies with all related regulatory requirements. The ordinance is enforced through requirements set forth by the city's zoning ordinance. In all areas of special flood hazard (100-year floodplain) identified by the Federal Emergency Management Agency in its Flood Insurance Rate Map (FIRM) the following provisions are required:

- ♦ All new construction and substantial improvements shall be anchored to prevent flotation, collapse, or lateral movement of the structure
- ♦ All new construction and substantial improvements shall be constructed with materials and utility equipment resistant to flood damages
- ♦ All new construction or substantial improvements shall be constructed by methods and practices that minimize flood damages

- Electrical, heating, ventilation, plumbing, air conditioning equipment, and other service facilities shall be designed and/or located so as to prevent water from entering or accumulating within the components during conditions of flooding

- All new and replacement water supply systems shall be designed to minimize or eliminate infiltration of flood waters into the system

- New and replacement sanitary sewage systems shall be designed to minimize or eliminate infiltration of flood waters into the systems and discharges from the systems into flood waters

- On-site waste disposal systems shall be located and constructed to avoid impairment to them or contamination from them during flooding

- Any alteration, repair, reconstruction, or improvements to a structure, which is in compliance with the provisions of this ordinance, shall meet the requirements of "new construction" as contained in this ordinance

In areas designated as floodways, no encroachments, including fill, new construction, substantial improvements, and other developments shall be permitted unless it has been demonstrated through hydrologic and hydraulic analyses performed in accordance with standard engineering practice that the proposed encroachment would not result in any increase in the flood levels during the occurrence of the base flood.

Following Hurricane Floyd in 1999, the City of Greenville modified its flood damage and prevention ordinance in February of 2000 to require that the minimum elevation of the lowest finished floor (FFE) of newly constructed and substantially reconstructed structures in the 100-year floodplain be increased from the base flood elevation of the 100-year flood event (BFE) to BFE plus one foot (BFE plus two feet for mobile homes). This ordinance was again changed in February of 2004 to state that structures built in the 100-year floodplain shall be constructed so their lowest finished floor elevation (FFE) is at or above the 500-year flood elevation level. This progressive policy change was implemented to ensure that sub-floor structures (e.g.: heating ducts, insulation, floor joists, etc.) are protected from flooding to the maximum degree reasonable. Other modifications to the flood damage and prevention ordinance include:

- Required skirting for mobile homes
- Required anchoring of propane tanks and decks associated with mobile homes
- Lowered the density of mobile home parks within the 100-year floodplain to 8 per acre for new or substantially redeveloped parks
- Required that new streets be constructed to no less than 1 foot below BFE

The Public Works Department is currently responsible for implementation of this ordinance. A Floodplain Development Administrator works out of the Engineering Division, and issues all elevation certificates for developments within the floodplain.

Goals and Objectives met:

- Decrease the Community's vulnerability to future hazard events
  - Implement stronger standards in the Flood Damage Prevention Ordinance
  - Ensure that the City has enough staff to administer and enforce current ordinances and policies to protect the City and to decrease its vulnerability
  - Consider hiring an environmental planner

❖ Community Rating System

Administered by FEMA, the Community Rating System (CRS) provides flood insurance discounts for residents in NFIP communities that undertake floodplain mitigation activities above the minimum NFIP standards. The City of Greenville participates in the CRS and maintains a Class 9 rating. Participation is voluntary and does require additional mitigation requirements beyond those required by the NFIP. It is the City's intention to lower its CRS rating to a Class 8 through the preparation of this hazard mitigation plan and continued commitment toward reducing the vulnerability of the city to natural hazards. Computer-based files should be available and requested when the City applies for this reclassification.

Goals and Objectives met:

- Decrease the Community's vulnerability to future hazard events
  - Improve education and outreach to the community regarding flood hazards and flood mitigation

❖ Minimum Housing Code

Pursuant to N.C.G.S. 160A-441, the City of Greenville has adopted a minimum housing code. The code regulates housing which has been found to be unfit for human habitation due to dilapidation; defects increasing the hazards of fire, accident, or other calamities; lack of ventilation, light, and sanitary facilities; and other conditions which may render a dwelling unit unfit for occupancy. The City of Greenville actively enforces its minimum housing code. Several dilapidated structures located in flood hazard areas have been acquired by the city and cleared through code enforcement.

Goals and Objectives met:

- Decrease the Community's vulnerability to future hazard events
  - Ensure that the City has enough staff to administer and enforce current ordinances and policies to protect the City and to decrease it's vulnerability

❖ Comprehensive Plan

The City of Greenville's Community Plan is known as Horizons, and serves as a policy guide to coordinate the development of land to serve in the public's best interest. Comprehensive plans provide a legal basis for decision making pursuant to Article 19, Chapter 160A-383 of the North Carolina General Statutes, which states that land use and zoning decisions shall be made in accordance with a comprehensive plan. Comprehensive plans affect decision making in such elements as community values, environmental protection, transportation efficiency, quality of housing and development, and sustainability of growth. Additionally, comprehensive plans are used by the public to obtain key facts about cities, to guide decision making to benefit the greater good of all the community's people, and to implement standards to sustain and improve the quality of life. The City of Greenville has had land use laws in place for over 50 years. The first attempt at a comprehensive plan was written in 1967, and known as The Land-Use Development Plan for the City of Greenville, NC. During the 1970's and 1980's, Greenville experienced unprecedented growth. Recognizing the need for a long-range plan to guide development decisions, City officials began work on the first version of Horizons in 1980, which was adopted by City Council in 1981. The purpose of this plan was to establish goals and policies regarding physical growth issues including water and sewer improvements, transportation, annexation, and future land uses for developing areas. While the 1981 plan served the City well for a number of years, the plan became severely outdated. In June of 1989, Greenville's Planning and Zoning Commission appointed a 15-member citizen committee to update the City's 1981 plan. This committee worked on the update for two years and created several key sub-issues within the newly revised 1992 Horizons Comprehensive Plan. In 1997, the Horizons Plan was updated once again with the addition of a future land use map. Additionally, this update began to focus on more critical issues such as preserving open space, protecting watershed areas, avoiding strip commercial development, protecting and preserving areas for greenways, maintaining strict floodway and floodplain regulation, preserving historic properties, preserving the character of existing and established neighborhoods, promoting interconnectivity of residential neighborhoods, and the encouragement of infill and mixed use developments. Another update of the Horizons Plan started in 2002. New goals were in mind for this update, and a Comprehensive Plan Committee was formed, which met for two years to discuss these goals. This plan, which is the current plan for the City was adopted in February of 2004. It is divided into the following sections:

- Future Land Use

  This section of the plan is intended to focus on the Principles of Urban Form such as paths, nodes, landmarks, edges, and districts; the Principles of Smart Growth, such as mixing of uses, human-scale design, and transportation options; the location of specific land uses such as commercial, residential, industrial, institutional, conservation/open space, etc.; and a separation of "vision" areas for the City.

  A new future land use map was created emphasizing major changes in the City's expected land use pattern. One key change, for example, is the addition of a

significant amount of land designated for conservation/open space use. This concept takes a major step towards positive mitigation planning and will be discussed later in this plan as a mitigation strategy that Greenville will continue to implement.

♦ Plan Elements

This section of the plan examines various forces and functions that shape Greenville's development, and establishes goals, objectives and policy statements to guide future decision-making in each area. They include housing, mobility/transportation, economic development, environmental quality, recreation and parks, utilities, community facilities, community character, and urban form and land use.

Some specific elements as they relate to this plan are identified in the recreation and parks section, and the policies on environmental quality. For example, it is an objective that the City promote more efficient use of open space and also preserve areas within floodplains as natural riparian buffers, and prevent more development within these areas that are susceptible to hazard events such as flooding.

♦ Plan Implementation

Implementation strategies and policy statements are major objectives of the Horizons plan. Specific implementing actions address land development and growth management issues, which become common sources when Planning and Zoning Commission or the City Council considers changing the zoning, adoption of a plan or policy, or a subdivision plat or site plan review. It is in this section where specific "vision" areas are given implementing actions and priorities such as growth occurs to plan for the overall sustainability of Greenville. Other plans and programs, such as the Hazard Mitigation Grant program are referenced in this plan as an implementation action, much like identifying mitigation actions and goals and objectives as part of this plan.

Goals and Objectives met:

- Decrease the Community's vulnerability to future hazard events
  - Preserve open space in flood hazard areas
  - Ensure that the City has enough staff to administer and enforce current ordinances and policies to protect the City and to decrease its vulnerability
- Minimize the damage to public infrastructure resulting from natural hazards
  - Avoid creating subdivisions with too many streets that would be susceptible to the impact of a natural hazard
  - Continue to support subdivision design that promotes connectivity to existing collector streets and major thoroughfares

- Minimize loss of personal and real property from natural hazards

  - Ensure that previously flooded or damaged properties are maintained as open space
  - Continue to support subdivision clustering to maximize density while preserving flood hazard areas

- Manage future development so that vulnerability to natural hazards is not significantly increased

  - Consider study of an urban growth boundary to control Greenville's sprawl
  - Delineate preferred growth areas away from the 100-year floodplain
  - Support infill development in established areas that have a lower risk of being significantly damaged from a flood or other disaster
  - Promote greenways, parks and recreation uses throughout the City, particularly along existing streams and in previously flooded areas utilizing flood buyout properties
  - Recommend rezoning requests to consider using the Conservation Overlay Zoning District to ensure that vulnerable areas will never be developed

❖ 2004 Greenway Master Plan

The 2004 Greenway Master Plan was adopted by the Greenville City Council on March 11, 2004 and has been designed to: 1) Re-evaluate the feasibility of the greenway corridor proposals found in the original plan, ensuring that they continue to be viable routes. 2) Offer alternatives for those corridors found to be no longer feasible. 3) Present new corridors that can provide opportunities in previously underserved areas of the community and can meet additional recreation, transportation, and natural area protection needs. In the system recommendations section, 42 maps have been included for each existing and proposed corridors and a detailed timeline of when land acquisition, master corridor planning, and construction steps should occur so that the development of Greenville's greenway system becomes a steady, measurable project over the following decades.

GREENWAYS

In addition to the detailed actions associated with each phase, there is an implementation chapter set up to get the greenway implementation process started. For the most part, the original 1991 greenway alignments remain viable proposals today. The system design is centered on a set of primary greenways along creeks and rivers. Connectors for bicycle and pedestrian traffic are then added to link the primary corridors to each other and to shopping, business, residential, education, and recreation destinations. Map 16 on the next page details the proposed greenway system.

The 2004 Greenway Master Plan also includes a funding chapter to help the community think through local strategies for raising capital, look for matching funds from other private and public sources, and help calculate the cost differences that might come from different trail designs and surfaces. Greenville has a significant history of greenway planning and the citizens have consistently shown broad support for the concept of

"putting the green back in Greenville" through the development of a comprehensive network of greenways. In general, citizens favor using existing tax dollars or other local government money for this sort of activity and they see greenways as an important tool in shaping the land use patterns in the community, providing additional transportation opportunities, protecting water quality and natural areas and, in the end, improving the quality of life for individuals living and working in Greenville. The implementation of a comprehensive greenways program in Greenville promises many benefits including enhanced water quality protection; preservation of critical wildlife habitat and green spaces; additional recreation, fitness, and education possibilities; and enhanced alternative transportation options for pedestrians and cyclists. All of these contribute to elevating the general quality of life in Greenville - increasing its appeal as a tourist destination, new business location, and thriving community where one might raise a family. In the end, investments in quality of life components yield a return to the bottom line of City and personal finances by increasing property values and subsequently increasing the City's tax base.

Goals and Objectives met:

- Manage future development so that vulnerability to natural hazards is not significantly increased
    - Promote greenways, parks and recreation uses throughout the City, particularly along existing streams and in previously flooded areas utilizing flood buyout properties or other city-owned properties
- Protect the fragile natural and scenic areas located along the Tar River and its tributaries
    - Ensure that stream buffers are undisturbed by development unless stormwater improvements are necessary, or walking trails based on the proposed greenway system can be established
    - Ensure that the appropriate greenway trail types are used in areas where preservation of natural materials is encouraged

❖ Tar River Floodplain Redevelopment Plan

Shortly after Hurricane Floyd swept through Greenville, a land use recovery plan was drafted for areas adjacent to the Tar River. The purpose of this plan is to guide the future development of land within these areas to prevent or minimize possible future effects of flooding on the properties. While this may be considered a primary goal in the way of public safety and stability, other factors must be taken into account when developing a long-range vision of the area. It is the intent of the City to ensure this area retains a sense of community with safe neighborhoods and a viable economy created through compatible mixtures of land uses.

This plan also includes a housing recovery section of the specific census tracts that were impacted, and creates an analysis of the reconstruction process to follow after Hurricane

Floyd. The Tar River Floodplain Redevelopment Plan will work hand in hand with other documents such as the Comprehensive Plan, the Flood Land Reuse Plan, and this plan to ensure that flood hazard areas are protected from future vulnerability.

Goals and Objectives met:

- Minimize loss of personal and real property from natural hazards
  - Ensure that previously flooded or damaged properties are maintained as open space
- Manage future development so that vulnerability to natural hazards is not significantly increased
  - Promote greenways, parks and recreation uses throughout the City, particularly along existing streams and in previously flooded areas utilizing flood buyout properties
- Protect the fragile natural and scenic areas located along the Tar River and its tributaries
  - Ensure that stream buffers are undisturbed by development unless stormwater improvements are necessary, or walking trails based on the proposed greenway system can be established
  - Ensure that the appropriate greenway trail types are used in areas where preservation of natural materials is encouraged

❖ Flood Land Reuse Plan

The City of Greenville adopted a Comprehensive Flood Land Reuse Plan on January 8, 2004, which serves the following purposes:

- To inventory properties that the City of Greenville acquired under the Hazard Mitigation Grant Program as a result of flooding from Hurricane Floyd
- To identify potential reuses in accordance with buyout property restrictions of the Federal Emergency Management Agency (FEMA), which will benefit the City and general public
- To offer guidance to the City of Greenville and its citizens on proper reuse and maintenance of these properties to ensure a much lower threat of flood destruction in the future

In determining how to use the acquired properties, the City appointed a team of staff members from the departments that will be most closely involved with the overall process. This committee included representatives from Planning and Community Development, Public Works and Recreation and Parks. It was the role of this team to assess the inventory of acquired properties and determine recommendations for their use in a fashion compliant with the restrictions placed on the properties by FEMA. The

plan was presented to the public through public meetings and open houses. The meetings were held at locations on both sides of the Tar River in an effort to make the meetings accessible to the greatest number of people. Additionally, the Greenville Utilities Commission was given opportunity to comment and offer suggestions for reuses that may meet their needs.

Once the properties were acquired, the issue became how to use the properties in a manner beneficial to the citizens of Greenville and at the same time safe from future flooding or storm events. This was largely determined by the restrictions placed on future use of these properties through their purchase under the HMGP buyout process, which were also placed on the deed at the time of acquisition. The following summarizes some of these restrictions:

- The property must be dedicated and maintained in perpetuity for uses compatible with open space, recreation, or wetlands management (Allowable open space, recreational, and wetland management uses including parks for outdoor recreational activities, nature reserves, cultivation, grazing, camping (except where adequate warning time is not available to allow evacuation), temporary storage in the open of wheeled vehicles which are easily movable (except mobile homes), unimproved, permeable parking lots and buffer zones. Allowable uses generally do not include walled buildings, flood reduction levees, or other uses that obstruct the natural and beneficial functions of the floodplain)

- No new structure(s) will be built on the property except those compatible with open space, recreation, or wetland management usage set forth by FEMA

- Any structure built on the property must be located to minimize the potential for flood damage, be flood-proofed, or elevated to the Base Flood Elevation plus one foot of freeboard

Reuse of the acquired properties must be in conformance with these restrictions. The restrictions are applicable to the City and to any parties that the City may elect to lease buyout property.

The reuse areas were divided into four individual "cluster" locations and a fifth category that is best defined as scattered sites. Areas having a collection of acquired properties within the same general geographic area determined the locations. A summary of the number of properties and acreage figures for each location is provided in Table 18.

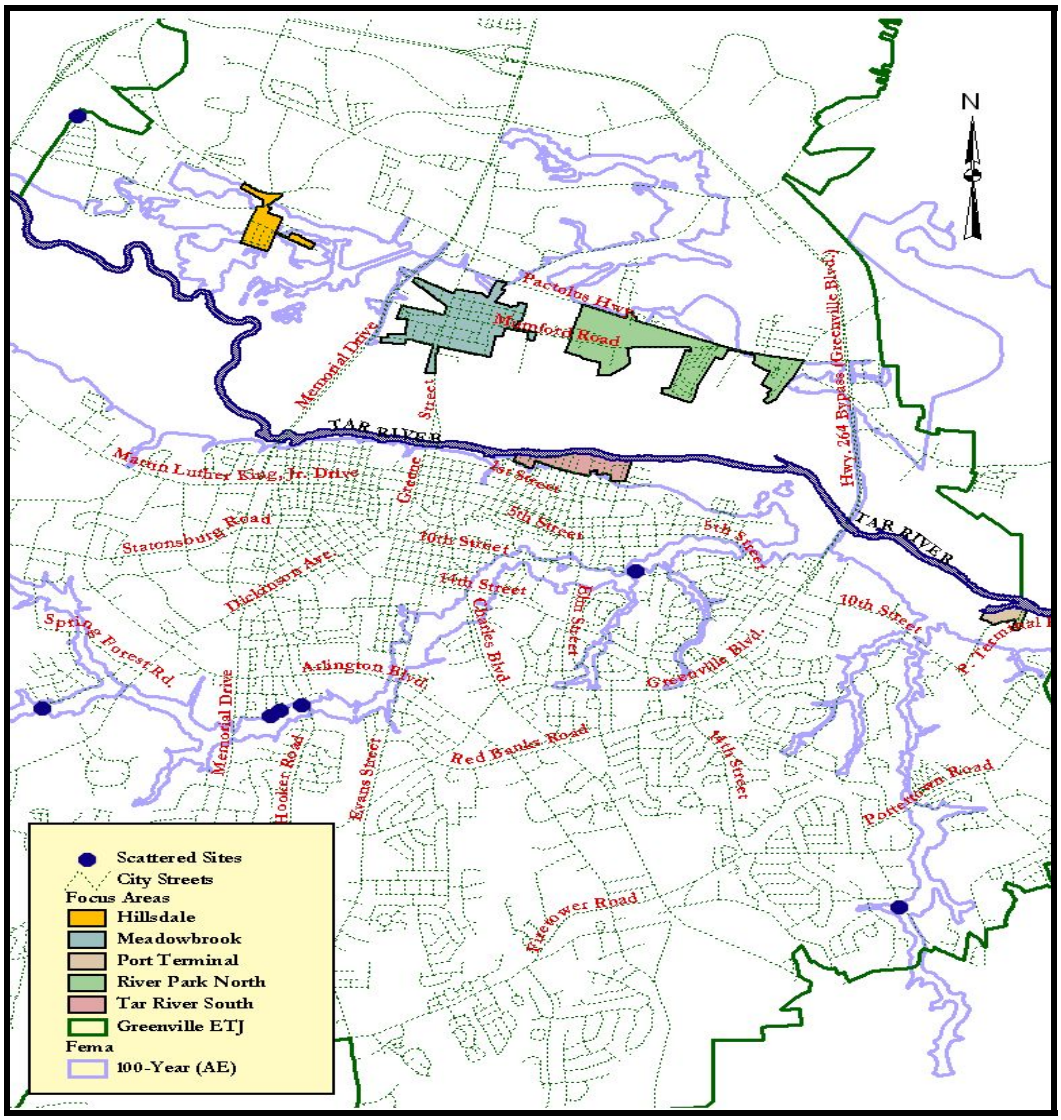
Table 18:
Flood Land Reuse Locations

Flood Reuse Location	Total Properties*	% of Total Buyouts	Total Acreage
River Park North	34	12.7%	76.3
Meadowbrook/Hillsdale	174	64.9%	51.9
Tar River South	49	18.3%	23.3

Port Terminal	4	1.5%	5.0
Scattered Properties	7	2.6%	4.6
Total	**268**	**100.0%**	**161.1**

The Flood Land Reuse Plan is intended to offer guidance to the City and the public on proper reuse of the numerous properties acquired through the buyout program as part of the recovery efforts resulting from extensive flooding. As a part of the program, significant restrictions are imposed on the reuse of the properties to ensure a much lower threat of destruction should another similar event occur in the future. However, this still leaves the City with a number of options for the reuse of the land, including parks, greenways, open space, etc. Additionally, it also provides opportunities for uses that can help meet the City's needs, such as space for the cultivation of plant material to be used in City projects.

MAP 15:
Flood Land Reuse Focus Area:



While the City has several options on how to reuse the property, it may also choose to lease a significant portion of the property to private individuals who have a need for additional space for gardening, cultivation, playfields, or other uses compatible with the goals of the disaster prevention program.

Goals and Objectives met:

- Decrease the community's vulnerability to future hazard events
  - Preserve open space in floodplain and environmentally sensitive areas
- Minimize loss of personal and real property from natural hazards
  - Ensure that previously flooded or damaged properties are maintained as open space
  - Establish a list of priorities for acquisition of private properties in the event of a future disaster
- Manage future development so that vulnerability to natural hazards is not significantly increased
  - Promote greenways, parks and recreation uses throughout the City, particularly along existing streams and in previously flooded areas utilizing flood buyout properties

❖ Recreation and Parks Comprehensive Master Plan 2000-2020

The Greenville Recreation and Parks Comprehensive Master Plan is a twenty-year comprehensive plan that contains an analysis of the existing park system in the City of Greenville, identifies the park and recreation needs of the community, and identifies new sites for parks and additional recreational opportunities to the citizens of Greenville based on growth and Greenville's change in character over time.

The Recreation and Parks Comprehensive Master Plan contains similar objectives as the 2004 Greenway Master Plan. Together, these documents go a long way in recommending the preservation of open space and maintaining the character of Greenville's green areas, in addition to providing quality recreational opportunities.

The City of Greenville currently contains 27 existing recreation and parks facilities, which consume close to 1,000 acres. Many of these sites have portions of land within the floodplain. By 2020, the City has plans to acquire properties for park land and recreation needs based on the growing population. These needs are divided up into district park lands (252 acres needed in addition to the 439 acres provided), community park lands (100 acres needed in addition to the 159 acres provided), neighborhood park lands (67 acres needed in addition to the 63 acres provided), and mini park/tot lots lands (15 acres needed in addition to the 6.1 acres provided).

Goals and Objectives met:

- Decrease the community's vulnerability to future hazard events
  - Preserve open space in floodplain and environmentally sensitive areas
- Minimize loss of personal and real property from natural hazards
  - Ensure that previously flooded or damaged properties are maintained as open space
- Manage future development so that vulnerability to natural hazards is not significantly increased
  - Promote greenways, parks and recreation uses throughout the City, particularly along existing streams and in previously flooded areas utilizing flood buyout properties

❖ Emergency Management Plan

The City of Greenville currently has a plan for emergency operations in the instance of a disaster already in place, which was adopted in December of 1984 shortly after the devastation of the Carolina Tornado Outbreak. This plan is designed to cover natural and man-made disasters, and covers the responsibilities of City staff following an emergency situation. This plan contains 4 levels of emergencies and assigns the roles of departments during and after a disaster has occurred depending on the level of the disaster. It is expected that this plan will be updated in the future as part of the Hazard Mitigation Plan.

Goals and Objectives met:

- Decrease the Community's vulnerability to future hazard events
  - Continue to update the City's Emergency Management Plan, and provide more strategies for City operations following a disaster. Consider combining the Emergency Management Plan with the Hazard Mitigation Plan, to make it tie in with mitigation strategies
  - Ensure that the City has enough staff to administer and enforce current ordinances and policies to protect the City and to decrease its vulnerability

❖ Flood Information Library

The City maintains a referenced section in the Sheppard Memorial Library, which provides literature on flood hazards and damage prevention. The Public Works Department is responsible for implementation and information on the flood information library.

Goals and Objectives met:

- Decrease the community's vulnerability to future hazard events
  - Improve education and outreach to the community regarding flood hazards and flood mitigation

❖ Spatial Data Explorer/Q3 Flood Data Online

The City maintains a web page that depicts the location of each parcel in the City and its extraterritorial jurisdiction (ETJ) relative to the 100 and 500-year floodplains, based on FEMA floodplain data (called "Q3" data). This information allows citizens, public policy makers, realtors and other interested parties to make informed decisions about land use, based on flood hazard risk. Public Works and the Planning Department work hand-in-hand on implementation of Q3 data.

Goals and Objectives met:

- Decrease the community's vulnerability to future hazard events
  - Improve education and outreach to the community regarding flood hazards and flood mitigation
- Maintain data in computer-based format, upgrade the City's GIS system, and upgrade and maintain information about hazards in the library collection
  - Maintain computer-based records in database format of all structures acquired or elevated through city sponsored projects

❖ Special Needs Database

Established to maintain a database of persons with disabilities, those needing special medication and/or medical care, and of Spanish speaking head of households and ensure that the pre-disaster (i.e.: evacuation) and post-disaster (i.e.: recovery) needs are met through the following actions:

A) Provision of Spanish language resources at Sheppard Library, City Hall, at the Housing Counselor's Offices, and at community based organizations and commercial enterprises that support the Latino community

B) Maintain a database of volunteer translators to assist Spanish speaking citizens with the recovery process

C) Identify bilingual City employees and ensure that they are available to assist in translating for Spanish speaking citizens who have recovery related issues with the City

D) Work with the local cable television provider to ensure that a Spanish-language cable station is provided, so that it can be used during the aftermath of disasters to communicate with the Spanish-speaking population

E) Develop a detailed contingency plan to coordinate the effective evacuation of persons with disabilities and those needing special medication and/or medical treatment through the Greenville Police and/or Fire Departments

Goals and Objectives met:

- Decrease the community's vulnerability to future hazard events
  - Improve education and outreach to the community regarding flood hazards and flood mitigation
  - Improve education, awareness and outreach to the community regarding other hazards that would affect the entire jurisdiction

❖ Water Supply Watershed Overlay District

Pursuant to State law of the North Carolina Department of Environment and Natural Resources (NCDENR), the City administers an overlay zoning district which limits density in areas upstream of water supply intake. This overlay district is implemented by the Planning Department primarily to ensure the quality of the City's (and its neighbors) drinking water supply. This overlay district also has the effect of limiting the amount of development in some areas of the Tar River floodplain.

Goals and Objectives met:

- Minimize loss of personal and real property from natural hazards
  - Continue to support Watershed Protection Ordinances

❖ Tree Planting and Protection Ordinance

Chapter 5 of the Greenville City Code regulates the planting, maintenance, and removal of trees and shrubs on public lands, encourages the protection of existing trees within the City, and established arboricultural standards and practices for tree protection in the City. This program covers all City owned and maintained properties. Whereas land covered with trees, rather than grass alone or pervious surfaces, allows less surface runoff, this effective program of tree planting and maintenance ensures reduced runoff from public and publicly maintained areas. The City Arborist implements this ordinance.

Goals and Objectives met:

- Protect the fragile natural and scenic areas located along the Tar River and its tributaries

- Continue to support tree planting and protection ordinances, and encourage tree preservation

❖ Stormwater Management Program

Through its Storm Drainage Ordinance (9-9), Subdivision Ordinance (9-5), and Manual of Standard Designs and Details, the City requires specific design standards for managing stormwater runoff from developed sites in the City and ETJ. These policies are highly effective for mitigating impacts of localized flooding due to development. The City's Stormwater Management Program, specifically is implemented and administered by the Public Works Department. The detailed regulations of this program apply only to the areas of the City that are located within the Tar-Pamlico River Basin. The City of Greenville has been identified as an National Pollutant Discharge Elimination System (NPDES) Phase II community, meaning that Phase II requirements will be enforced within the river basin include limiting impervious cover and enforcing riparian buffer rules. The program objective is to improve the water quality of stormwater runoff that enters the natural waters located in and outside of the City of Greenville.

Goals and Objectives met:

- Decrease the community's vulnerability to future hazard events
  - Preserve open space in floodplain and environmentally sensitive areas
- Minimize loss of personal and real property from natural hazards
  - Continue to support subdivision clustering to maximize density while preserving flood hazard areas
- Minimize the damage to public infrastructure resulting from natural hazards
  - Continue to support existing stormwater control ordinances established by the City and State. Ensure that development complies with all stormwater regulations
- Protect the fragile natural and scenic areas located along the Tar River and its tributaries
  - Ensure that stream buffers are undisturbed by development unless stormwater improvements are necessary, or walking trails based on the proposed greenway system can be established

D. FUTURE IMPLEMENTATION STRATEGIES

The following are proposed implementation strategies in addition to the existing strategies established to meet the goals and objectives of this plan:

❖ Comprehensive Infrastructure Plan

The City of Greenville shall work with the Greenville Utilities Commission to locate and map all utility functions and provide coverages within the City's Geographic Information System Database. The GIS Manager for the City shall work with the GIS coordinator of the GUC to create this data. This includes finding all necessary easements recorded. Greenville Utilities Commission shall also work with the City on the location of its utilities within the floodplain. The infrastructure plan shall also provide an objective for disaster recovery.

Goals and Objectives met:

- Minimize the damage to public infrastructure resulting from natural hazards
  - Access and maintain a better GIS system with utility coverages
  - Develop a plan for relocating public infrastructure out of flood hazard areas

❖ Required Open Space Ordinance

As part of the Zoning, Subdivision and Flood Damage Prevention Ordinances, the City shall establish regulations that require dedicated open space as part of a medium or high-density development. Dedicated open space will depend on the size of the development. Such open space should consist of environmentally sensitive and flood prone areas for the most part, but also useable recreation space.

Goals and Objectives met:

- Decrease the community's vulnerability to future hazard events
  - Preserve open space in floodplain and environmentally sensitive areas
- Minimize loss of personal and real property from natural disasters
  - Continue to support subdivision clustering to maximize density while preserving flood hazard areas
- Manage future development so that vulnerability to natural hazards is not significantly increased
  - Continue to support subdivision clustering to maximize density while preserving flood hazard areas

- Ensure that previously flooded properties are maintained as open space
- Promote greenways, parks and recreation uses throughout the City, particularly along existing streams and in previously flooded areas utilizing flood buyout properties
- Recommend rezoning requests to consider using the Conservation Overlay Zoning District to ensure that vulnerable areas will never be developed

❖ Transfer of Development Rights (TDR's)

The City may consider using TDR's to keep development out of an area not suited for it despite zoning, and transfer such development to a more suitable area. The owner of the property not suited for development can be compensated with useable rights on another property. This technique is usually used to preserve low-density development and/or open space while concentrating intensive development in existing or planned urban service areas.

Goals and Objectives met:

- Decrease the community's vulnerability to future hazard events
  - Preserve open space in floodplain and environmentally sensitive areas

❖ Post Disaster Recovery and Reconstruction Plan (PDRRP)

The City shall either create a Post Disaster Recovery and Reconstruction Plan, or establish a comprehensive hazard recovery section as part of the Emergency Operations Manual. This plan shall be an extension of the Hazard Mitigation Plan, but shall focus specifically on reducing vulnerability from possible disasters, and outline the process for expediting post disaster recovery and reconstruction. For example, if a hurricane smashes into Greenville and leaves a disaster similar to Hurricane Floyd, The PDRRP will outline the appropriate measures the City should take immediately (basically an extended and more defined version of the Disaster Recovery Coordination Strategy). The critical facilities identified in this plan shall be made a part of the PDRRP, and shall be operational before, and immediately following an event. This plan will be an extension on how the City responds to these events and will cover the grant sources the City shall seek funding from (HMGP, Infrastructure, etc.) for buyout and relocation of its residents. Prior to Floyd, there was no comprehensive plan that covered these elements. This plan shall also cover man-made disasters such as chemical spills since they are also likely to occur in Greenville along the railroad tracks. In general, the concept of a man-made disaster should not be excluded from discussion here, and the City may consider adding some of these events to its update of the Hazard Mitigation Plan.

Goals and Objectives met:

- Decrease the community's vulnerability to future hazard events

- Improve education and outreach to the community regarding other hazards that would affect the entire jurisdiction
- Consider adding all types of hazards, including recovery and reconstruction from man-made disasters such as chemical spills, or terrorism

➢ Reduce loss of life and personal injury from natural hazards

- Ensure that critical facilities are identified and operational immediately after the occurrence of a hazard
- Ensure that emergency response is operational, cross reference the Emergency Operations Plan

➢ Expedite post disaster recovery and reconstruction.

- Apply for grants that provide for housing and tenant relocation
- Establish a Flood and Hazard Recovery Division of the Planning Department. Temporary staff positions would be necessary

❖ All Hazards Information Library

Change the City's Flood Information Library to the All Hazards Information Library to include this plan, information on all natural disasters, and the Post Disaster Recovery and Reconstruction Plan. This library will also contain the City's Flood Land Reuse Plan. This library shall also contain a computer system, which can illustrate data on the history of disaster occurrences, and can show maps.

Goals and Objectives met:

➢ Decrease the community's vulnerability to future hazard events

- Improve education and outreach to the community regarding flood hazards and flood mitigation
- Improve education, awareness and outreach to the community regarding other hazards that would affect the entire jurisdiction
- Consider adding all types of hazards, including recovery and reconstruction from man-made disasters such as chemical spills, or terrorism

➢ Maintain data in computer-based format, and upgrade and maintain information about hazards in the library collection

- Enhance the City's current flood hazard library collection to include this plan as well as information on all types of natural disasters it references

❖ Critical Watershed Protection Areas

Increase the boundaries of the City's current Watershed Protection Overlay to include the entire Tar River Basin, and also include areas to the south of Greenville that flow to

the Neuse River. Consider naming the new watershed as a WS-CA (Critical Area) in accordance with NCDENR Division of Water Quality. This will limit impervious coverage within the region, create larger stream buffers, and control stormwater runoff. It will also increase the quality of Greenville's drinking water supply, and prevent further pollution of the Tar River.

Goals and Objectives met:

- Minimize the loss of personal and real property from natural hazards
  - Continue to support Watershed Protection Ordinances, and consider establishing more watershed protection areas
  - Consider increasing perennial stream buffer requirements and require buffers along all intermittent streams as well as perennial streams
- Protect the fragile natural and scenic areas located along the Tar River and its tributaries
  - Ensure that stream buffers are undisturbed by development unless stormwater improvements are necessary, or walking trails based on the proposed greenway system can be established

❖ Environmental Planner

The City of Greenville shall consider creating a position for an Environmental Planner This staff member would handle all aspects as they relate to the natural environment including vegetation regulations, flood damage and prevention standards, greenways, comprehensive environmental plans, and administration of hazard mitigation and flood recovery. This person would be responsible for administering the proposed Post Disaster Recovery and Reconstruction Plan, and would identify and establish the critical facilities that are identified in this plan. This person would also administer greater watershed, floodplain, and tree protection ordinances.

Goals and Objectives met:

- Decrease the community's vulnerability to future hazard events
  - Consider hiring an environmental planner for the City
- Reduce loss of life and personal injury from natural hazards
  - Ensure that critical facilities are operational immediately after the occurrence of a hazard
- Minimize the damage to public infrastructure resulting from natural hazards
  - Make sure that emergency evacuation routes are identified

- Continue to support existing stormwater control ordinances established by the City and State. Ensure that development complies with all stormwater regulations

➢ Maintain data in computer-based format, and upgrade and maintain information about hazards in the library collection

- Enhance the City's website to include information about hazard mitigation and the programs and policies it relates to
- Enhance the City's current flood hazard library collection to include this plan as well as information on all types of natural disasters it references

➢ Minimize loss of personal and real property from natural hazards

- Ensure that previously flooded or damaged properties are maintained as open space
- Establish a list of priorities for acquisition of private properties in the event of a future disaster
- Continue to support Watershed Protection Ordinances, and consider establishing more watershed protection areas
- Consider increasing perennial stream buffer requirements and require buffers along all intermittent streams as well as perennial streams

➢ Manage future development so that vulnerability to natural hazards is not significantly increased

- Promote greenways, parks and recreation uses throughout the City, particularly along existing streams and in previously flooded areas utilizing flood buyout properties
- Recommend rezoning requests to consider using the Conservation Overlay Zoning District to ensure that vulnerable areas will never be developed

➢ Expedite post disaster reconstruction

- Develop a comprehensive post disaster recovery and reconstruction plan for the City
- Participate in the directives of the Pitt County Emergency Operations Plan (EOP)
- Continue to establish a flood recovery center when needed to address post disaster issues. Utilize existing staff and create temporary positions for the FRC. Utilize the environmental planner to direct the division
- Continue to seek funding from state sources such as the Hazard Mitigation Grant Program and the Housing Crisis Assistance Funds for housing and tenant relocation projects
- Ensure that critical facilities are located within reasonable locations. Consider developing new facilities where needed

- Protect the fragile natural and scenic areas located along the Tar River and its tributaries

  - Consider establishing a tree preservation and protection ordinance that will address clear cutting and tree removal on private properties
  - Ensure that stream buffers are undisturbed by development unless stormwater improvements are necessary, or walking trails based on the proposed greenway system can be established
  - Ensure that the appropriate greenway trail types are used in areas where preservation of natural materials is encouraged

❖ Center City Redevelopment Plan

The City of Greenville is currently working with consultants to create a plan to revitalize downtown, and areas of West Greenville. The Redevelopment Commission is working with the citizens of West Greenville, and with business owners downtown to determine the best options for bringing people back to the center city, and making Greenville's urban core more sustainable thereby improving the quality of life for all residents. A non-profit group known as Uptown Greenville, Inc. also works with staff, the redevelopment commission and consultants on current projects downtown that will tie in to the recommendations of the proposed plan. The Center City Redevelopment Plan helps to recommend against urban sprawl, and promotes infill housing.

Goals and Objectives met:

- Manage future development so that vulnerability to natural hazards is not significantly increased

  - Support infill development in established areas that have a lower risk of being significantly damaged from a flood or other hazard event

❖ Update the Tree Planting and Protection Ordinance

The Tree Planting and Protection Ordinance shall be updated to include a section on preservation within buffers, and will address clear cutting and tree removal on private properties.

Goals and Objectives met:

- Protect the fragile natural and scenic areas located along the Tar River and its tributaries

  - Consider establishing a tree preservation and protection ordinance that will address clear-cutting and tree removal on private properties.

❖ Flood Insurance Rate Maps (FIRM's)

The City shall petition FEMA to review the city's Flood Insurance Rate Maps (FIRM's) and revise them if appropriate. Recent flooding in Greenville has shown the need for a high level of accuracy for the City's existing FIRM's.

Goals and Objectives met:

- Decrease the community's vulnerability to future hazard events
  - Implement stricter development standards in the Flood Damage Prevention Ordinance

❖ City of Greenville, North Carolina Website

The City shall update its website to include information regarding natural hazards, GIS maps of the city including the maps created for this plan, and information about hazard mitigation. This website would also describe the CRS reporting requirements, the Hazard Mitigation Grant Program, and other sources of funding. Eventually, all plans, programs and policies the City of Greenville provides shall be in digital format including this plan and all the other plans and programs it references.

Goals and Objectives met:

- Decrease the community's vulnerability to future hazard events
  - Improve education and outreach to the community regarding flood hazards and flood mitigation
  - Improve education, awareness and outreach to the community regarding other hazards that would affect the entire jurisdiction
- Maintain data in computer-based format, upgrade the City's GIS system, and upgrade and maintain information about hazards in the library collection
  - Enhance the City's website to include information about Hazard Mitigation and the programs and policies it relates to

E. IMPLEMENTATION TIMELINE

Table 19 provides a summary of the proposed implementation strategies and the timeline for completing them. Flooding is considered the highest priority, but all other hazards are considered collectively when creating some of these strategies. Priority levels are organized as follows:

- Priority A = 1-3 years (Start within the first year, finish by the third)
- Priority B = 4-6 years (Start within the 4th year, finish by the 6th)
- Priority C = 7-9 years (Start within the 7th year, finish by the 9th)

- Priority D = 10-12 years (Start within the 10th year, finish by the 12th)

The hazard mitigation plan team performed a process for prioritization of these strategies. The following criteria for prioritization were used:

- Cost-Benefit Review
- Results of Hazard Identification and Analysis
- Results of Vulnerability Analysis
- Results of Community Capability Assessment
- Effectiveness in meeting hazard mitigation goals and comprehensive plan goals

Table 19:
Implementation Timeline

Strategy	Priority	Responsibility	$ Source	Status
Flood Damage & Prevention Ordinance	On-going	Public Works, Planning	Operating Budget	On-going
Community Rating System	On-going	Planning & Development	N/A	Lower CRS Rating to class 8
Comprehensive Plan	On-going	Planning & Development	CIP	Plans printed, Planning Dept. Long Range Div. To begin Small Area Planning
2004 Greenway Master Plan & Construction Projects	On-going 6 Priority Levels (25+ years)	Planning & Development, Support Group 501(C)(3) Greenways Committee, Public Works	CIP, 501(C)(3)	Currently working on prio. A projects (2004-2007), & establishment of non-profit support group.
Tar River Floodplain Redevelopment Plan	Completed	Planning & Development Public Works Recreation and Parks	N/A	This plan has been tied in to reuse categories associated with the FL Reuse Plan
Flood Land Reuse Plan	On-going	Planning & Development	HMGP	Previously flooded properties bought-out using HMGP & CDBG funds are being leased for 5-10 year periods
Recreation & Parks Master Plan	On-going	Recreation & Parks	CIP	
Comp. Infrastructure Location Plan	Priority A	Planning & Development Greenville Utilities Comm.	???	Acquire infrastructural data from GUC. Identify areas where utilities are vulnerable to hazards. Identify where utilities are needed.

Required Open Space Ordinance	Priority A	Planning & Development	Operating Budget	Amend the subdivision ordinance to include required open space and recreation Areas.
Update Greenville Webpage	Priority A	Planning & Development IT Department	Operating, University, Internships	Upgrade the City's website to include hazard mitigation info.
Center City Redevelopment Plan, & CDBG Projects	Priority A (On-going)	Planning & Development, Redevelopment Commission	Bonds, Grants, CIP, Etc.	Currently being prepared, the redevelopment plan will promote infill development
Post Disaster Recovery & Reconstruction Plan	Priority B	Planning & Development Public Works Police & Fire Rescue	Operating Budget	This could be an added section to the Emergency Operations Manual to describe post disaster procedures.
Critical Watershed Protection Area	Priority B	Planning & Development	NCDENR - DWQ	Increase the boundaries of the City's watershed, & classify as "Critical" (WS-CA) Increase stream buffers
Create Environmental Planner Position	Priority C	Planning & Development	Operating Budget	Establish a new position for an environmental planner to serve as the hazard mitigation admin. & work with flood recovery and emergency operations.
Update FIRM Maps	Priority C	Planning & Development	FEMA	Review the current FIRM Maps regularly & update if needed.
Natural Hazard Info. Library	Priority D	Planning & Development Public Works	Operating Budget	Upgrade the Flood Hazard Library and Create a Natural Hazards Library with more information.
Transfer of Development Rights Standards (TDR's)	Priority D	Planning & Development	Operating Budget	Create standards for TDR's to set up receiving zones for preferred development patterns

Tree Planting & Protection Ordinance Update	Priority D	Planning & Development	Operating Budget	Update the existing plan to include clear-cutting and preservation standards.

F. MONITORING & EVALUATION

❖ Assessment of Goals, Objectives & Implementation Strategies

The goals and objectives of this plan adequately address all hazard mitigation issues in accordance with federal, state and local requirements. Goals and objectives may change over time if it is determined that new risks are associated with the Greenville region, or the federal or state government changes or updates hazard mitigation regulations. The implementation strategies were developed by the Hazard Mitigation Plan team, and adequately reflect Greenville's position on how to handle hazard mitigation, and how we can meet the goals and objectives.

❖ Procedure for Monitoring the Plan

The Hazard Mitigation Plan shall be monitored on a semi-annual basis. The monitoring process shall be conducted by the Planning and Community Development Department. At this time, it will be monitored within the Long Range Planning Division by one of the Planners, but it is the intention to turn monitoring of the plan over to an Environmental Planner should the City decide the position is needed. Monitoring will include checking the status of all implementation strategies, and making sure they are in the proper review stage. Monitoring will be done semi-annually, however a report will be produced annually.

❖ Procedure for Evaluation of the Plan

The Planning and Community Development Department will evaluate the plan bi-annually. The first evaluation will be due by ***December 31, 2006***, and will commence on a two-year cycle immediately following. It is very important to implement the strategies set forth in the plan, but also to commit to regularly sticking to the existing ones. The plan will be evaluated periodically, and will be used as a guide when making other land use decisions, or making comments on specific events in which it is necessary to reference the plan. Specifically with development activities within the floodplain, or annexations, which increase the City's boundaries, this plan will evaluate that certain circumstances would not be recommended. Evaluation will be processed by a staff member and shall answer the following questions:

- Do the goals and objectives address current and expected conditions?

  The established goals and objectives are expected to be met by evaluating the current progress and implementation of current and future strategies.

- Has the nature or magnitude of risks changed?

Since the first draft of the plan was written, the magnitude and risk assessment has been adjusted to include more hazards, and establish vulnerability for newer buildings and critical facilities.

- Are the current resources appropriate for implementing the plan?

  There are several proposed implementation strategies (such as the Comprehensive Infrastructure Plan, the Required Open Space Ordinance, and the Post Disaster Recovery and Reconstruction Plan) that would be appropriate for complete implementation over the next five years. An updated evaluation will be assessed on the updated plan sometime in the next two (2) years.

- Are there implementation problems, such as technical, political, legal or coordination issues with other agencies?

  Establishing an environmental planner would help administration and evaluation of the plan considerably. There are no other technical problems the City is aware of at this time.

- Have the outcomes occurred as expected?

  The plan has been updated to meet the requirements of the DMA of 2000. It is anticipated that the City is on schedule.

- Did the agencies and other partners participate in the plan and planning process as proposed?

  Other agencies have had ample opportunities to review the plan as it has been advertised for public hearing in the local newspaper, and letters have been sent to several entities (provided in the appendix). East Carolina University was the only major respondent with specific comments on their critical facilities. This process will once again be evaluated in two years.

These questions will be answered upon submittal of an evaluation report bi-annually.

❖ Procedure for Amending the Hazard Mitigation Plan

Revisions to the Hazard Mitigation Plan will help ensure that local mitigation efforts include the latest and most effective mitigation techniques. Periodic revisions may also be necessary to keep the plan in compliance with all federal and state statutes and regulations. For example, the plan shall be amended within the next two years to include more information on future critical facilities, their locations, and their associated costs. Additional development, implementation of mitigation efforts, development of new mitigation processes, and changes in federal and state statutes and regulations may all affect the local hazard mitigation plan. In the context of a Federal disaster declaration, state and local governments are allowed to update or expand an existing plan to reflect circumstances arising out of the disaster. An updated plan in this circumstance might include a re-evaluation of the hazards and the jurisdiction's exposure to them, a re-assessment of existing mitigation capabilities, and new or additional mitigation recommendations.

The plan will first be revised in the next two (2) years in order to complete the requirements of future vulnerability assessment, and to update FEMA on the progress of the implementation strategies, **more specifically, by December 31, 2006.** After the first review and evaluation, the plan will be reviewed, evaluated and updated every five (5) years. Once the plan is updated, it will be resubmitted to the North Carolina State Hazard Mitigation Office and to FEMA for review and approval.

Additionally, in the event that any of the disasters occur that appear in this plan, or don't appear in this plan, the plan will be updated to accommodate any change in information, or to outline any new procedures and/or strategies.

- **Initiation of Amendments**

  Any person or organization, including the Planning Department, may petition the City Council to amend the Hazard Mitigation Plan. The petition shall be filed with the Planning Department and shall include a description of the proposed text or map amendment, along with an explanation of the changing circumstances that necessitate consideration of the amendment. Upon initiation of a text or map amendment, the Planning Department shall forward the proposed amendment to all interested parties, including, but not limited to, all affected City departments, and other interested agencies such as Pitt County, the North Carolina Division of Emergency Management, the United States Army Corps of Engineers, and the Natural Resource Conservation Service for a 30-day review and comment period. At the end of the comment period, the proposed amendment shall be forwarded along with all review comments to the Environmental Advisory Commission, and the Planning and Zoning Commission for their consideration. If no comments are received from the reviewing department or agency within the specified review period, such amendment shall be noted in the Planning Department's recommendation to these commissions.

- **Review and Recommendation by the Environmental Advisory Commission (EAC), and by the Planning & Zoning Commission (PZ)**

  The EAC and PZ Commissions shall review the proposed amendment, along with the Planning Department's recommendation and any comments received from other departments and agencies. The EAC and PZ shall submit its recommendation on the proposed amendment to the City Council within forty-five (45) days. Failure of these commissions to do this within this time period shall constitute a favorable recommendation.

- **Public Hearing Requirements**

  No amendment to the Hazard Mitigation Plan may be adopted until a public hearing has been held. Upon receipt of a recommendation from the EAC and PZ Commissions, the Planning Department shall, after consultation with the Clerk to the Board, schedule a public hearing before the City Council. The public notice shall be published one (1) time in a newspaper having general circulation within the

City at least ten (10) days prior to the scheduled public hearing date. In computing this period, the date of publication shall not be counted but the date of the public hearing shall be. With respect to map amendments, the Planning Department shall provide first-class mail notice of the public hearing to: (a) Owners, according to county tax records, of all properties whose use of land may be affected by the proposed amendment; and (b) Owners, according to tax records, of all properties adjacent to the properties affected by the proposed amendment. The Planning Department may also post notices of the public hearing in the vicinity of the properties affected by the proposed amendment and take any other action deemed by the Planning Department to be useful or appropriate to give notice of the public hearing. The notice required or authorized by this section shall: (a) State the date, time, and place of the public hearing; (b) Summarize the nature and character of the proposed change; (c) If the proposed amendment involves a change in potential use of the land, reasonably identify the property whose potential land use would be affected by the amendment; (d) State that the full text of the amendment can be obtained from the City of Greenville Planning Department; and (e) State that substantial changes in the proposed amendment may be made following the public hearing.

❖ Implementation of this Plan

This plan will be implemented as described in table 17. No implementation problems surface at this time. Any details on ways to implement the plan are being addressed. Technical problems or problems with coordinating the administration of this plan will be addressed and will not continue as problems. The evaluation and first update will occur within the next two years no later than December 31, 2006.

END OF SECTION